TECHNOLOGY DEPT

THE Chemical Age

VOL. LXXI 3 JULY 1954 No. 1825

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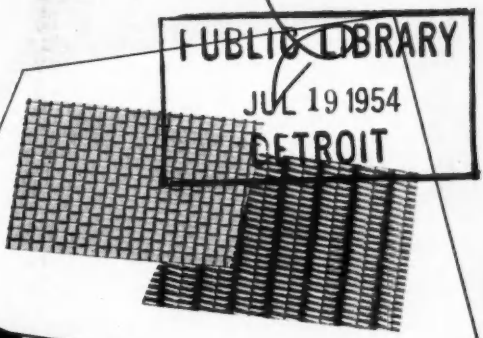

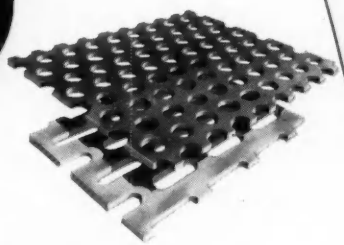

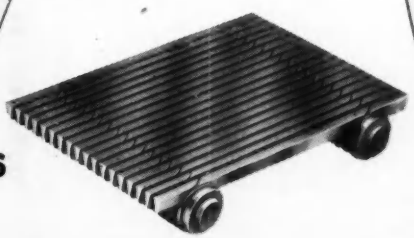

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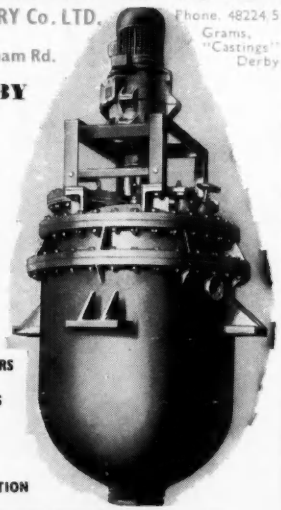

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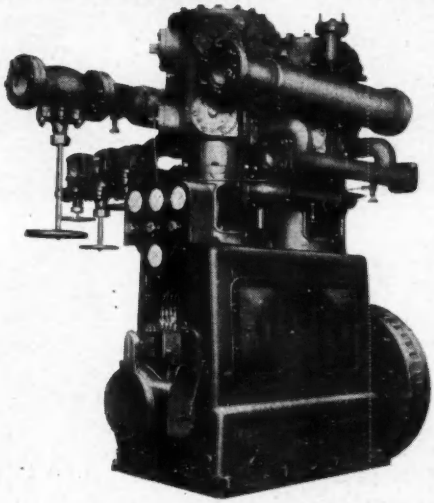

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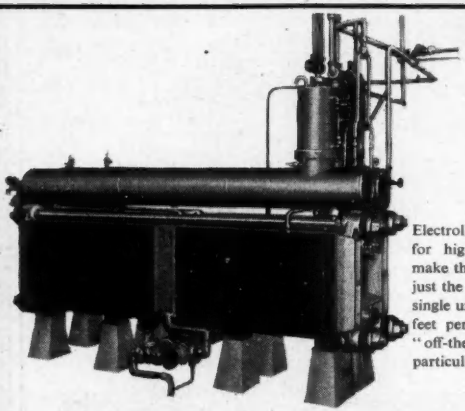

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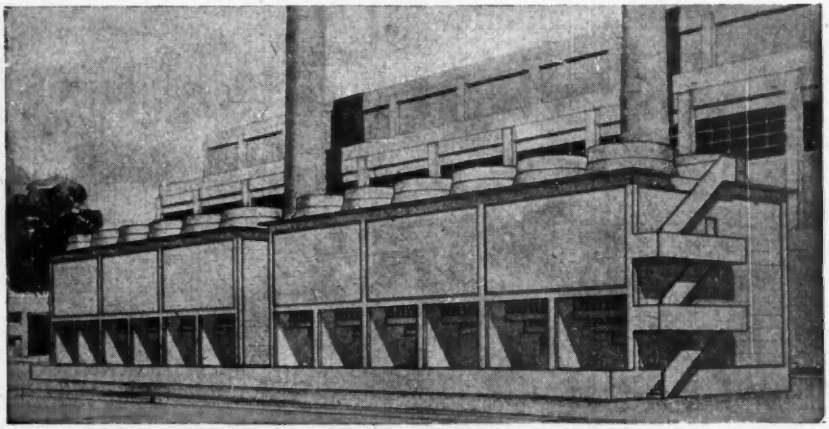

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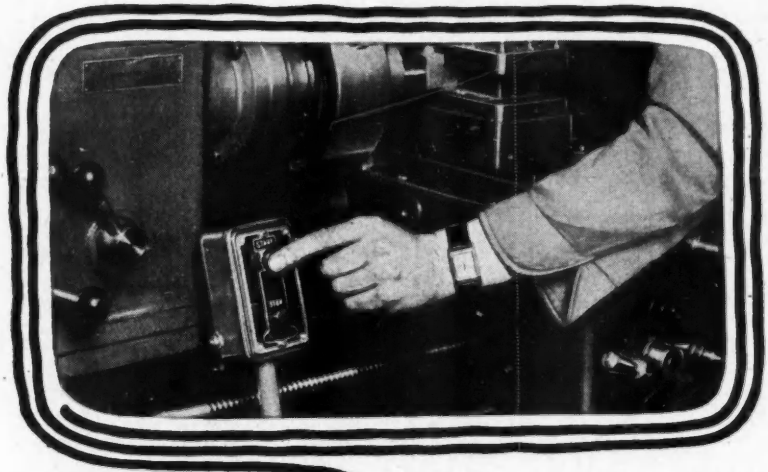

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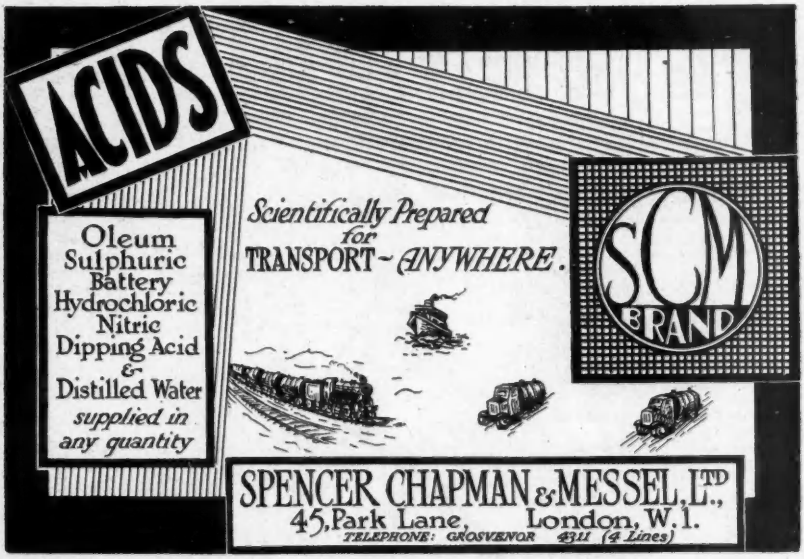

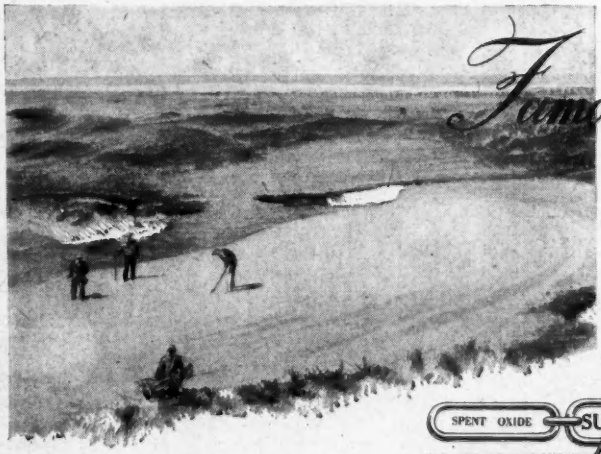

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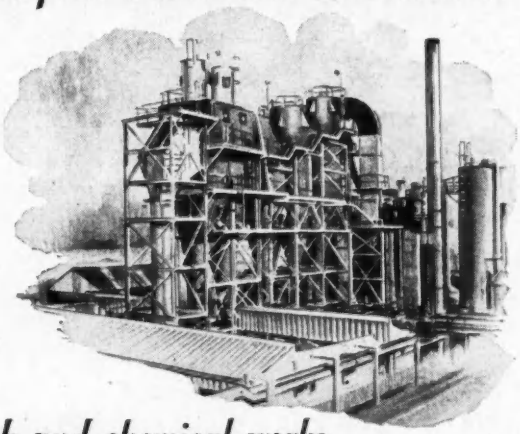

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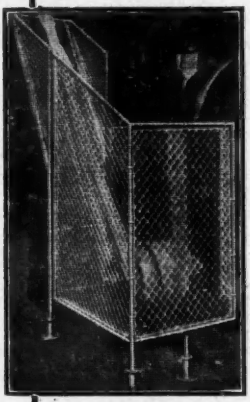

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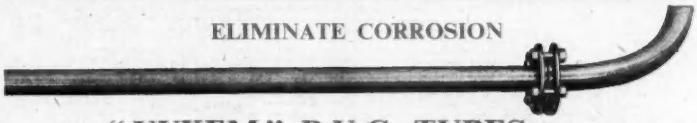

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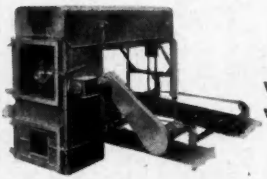

The "Adequate" Weigher shown with recorder doors open.

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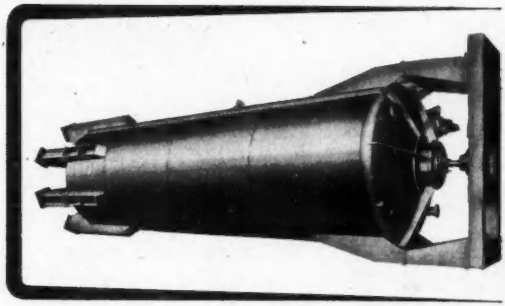

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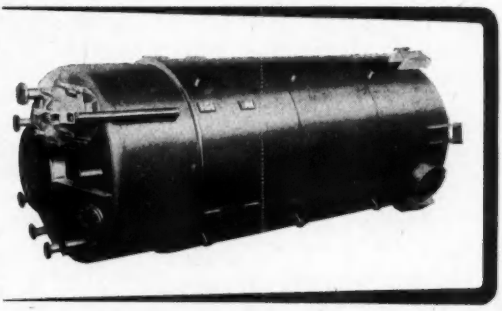

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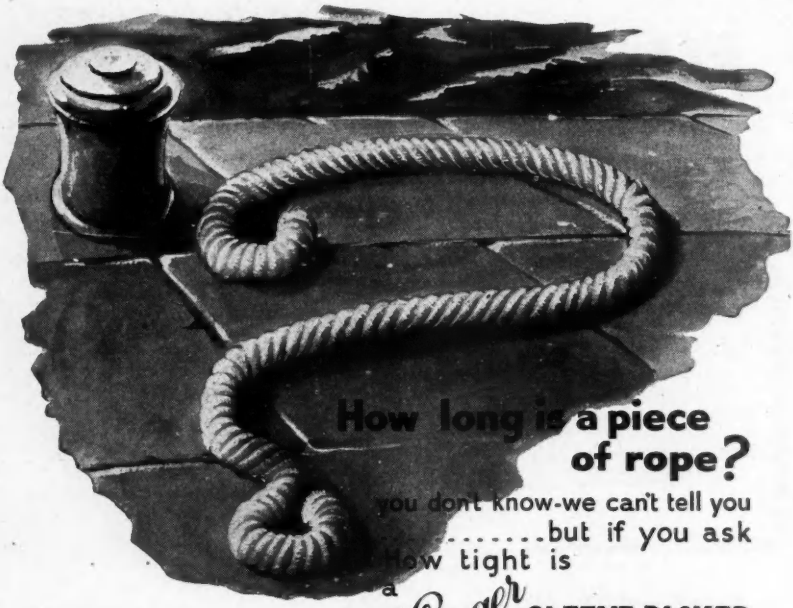

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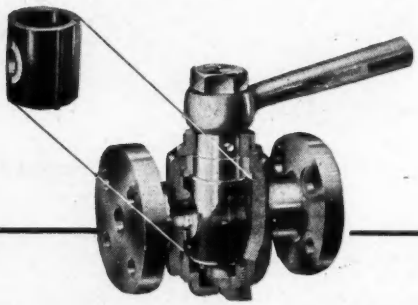

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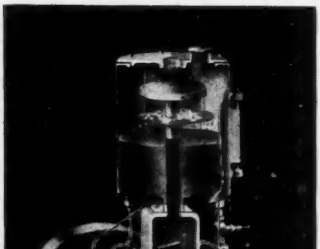

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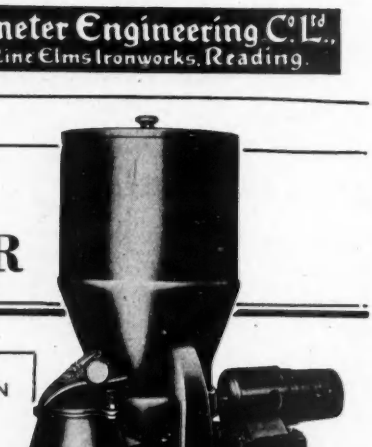

EXTENSIVELY USED FOR THE APPLICATION OF POWDERED REAGENTS FOR WATER TREATMENT PURPOSES AND FOR MEASURING AND PROPORTIONING POWDERED OR GRANULAR SUBSTANCES

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Fire Research

FIRE research is a comparatively youthful activity in Britain though causes of fires and methods of coping with them have, of course, been studied for many years by fire brigades and insurance companies. The Joint Fire Research Organisation with its station centre at Boreham Wood, jointly created by the DSIR and the Fire Officers' Committee, has only just emerged from the difficult initial phase of staff recruitment and training. Its seventh and latest Report—for 1953 (HMSO, 44 pp., 2s. 6d.)—is perhaps not unfairly described as the first to show that striking contributions to knowledge about fires and fire protection are beginning to be made.

As with so many subjects whose technology has long been developed in a piecemeal and empirical fashion, there is a stark need for fundamental research, and ' in all sections of the laboratory the pressure to obtain information for particular purposes can only be at the expense of basic research . . . ' It is clear that the initial period of research, which has at least given a good pre-view of the problems involved and the possibilities of progress, has shown already that a bigger research station and a larger staff are required. However, the Report suggests that there is some hope of staff augmentation and building expansion in the near future.

Chemistry is not a remote subject so far as fires and fire-fighting are concerned. Combustion is a chemical reaction whether controlled or out of hand. One conclusion that can readily be drawn from the Report is that we have yet to get to close grips with the dynamics of flame propagation. Since the earlier days of alchemy and early modern chemistry, when flames as consequences of oxidation attracted so much interest, the study of reactions has been more concerned with those which can be regulated in their violence. Extra-mural investigations at the Imperial College of Science and Technology which have been sponsored by the Joint Fire Research Organisation have now shown that there is a peak in the energy distribution of a flame front, and this unevenness of energy distribution may well be the determining factor in such properties of flames as stability, ignition, and flammability limit, properties which hitherto have not been plausibly correlated by any theory of flame behaviour. Progress in this fundamental direction may well lead to advances in our largely empirical technology of flame-quenching.

Chemistry, too, is very much concerned with the practical subject of fire-extinguishers. Here the pressing need of the fire services is for a liquid that can put out fires without also developing toxic gases as secondary products. Methyl bromide is an efficient extinguishing and volatile liquid but it adds a serious toxic risk to the already formidable list of fire-fighting dangers. Previous research has shown that there are alternative halogenated organic liquids which are efficient extinguishers but less toxic than methyl bromide, notably chlorobromomethane and trifluorobromomethane. Further research has now shown that the principal toxic product formed when these organic substances are used is the hydrogen halide (or halides) of the halogen element (or elements) in the liquids. The extent of their production by thermal decomposition does not appear to be very great (though it is markedly larger for carbon tetrachloride), but the air concentrations produced in all tests were rather above safe limits even for short-time exposure.

The best pointer towards lower toxicity seems to be the development of maximum extinguishing efficiency in an organo-halide; the smaller the amount of liquid needed to put out a fire, the smaller must be the resultant air concen-

tration of toxic decomposition products. At present this favours the use of trifluorobromomethane. It is important nevertheless, to know the nature of the risk. The halide-acids are all pungent in odour and they at least carry their own warning when concentration rises dangerously. Fire-fighting is much the same as a military operation; risks cannot be eliminated but one risk can be balanced against another. If the toxic risk of using extinguishing liquids can be reliably predicted, then it can be balanced strategically against the risk of not using this method to reduce fire intensity.

Spontaneous heating is another chemically concerned subject. It is not by any means a rare cause of fire outbreaks. In 1952, 216 fires in buildings and 748 fires not in buildings were attributable to spontaneous combustion; and these figures are not unusually different from those for the four preceding years. A reliable test for determining the spontaneous heating risk of a particular material is being sought but it has not yet been developed; a test used in the textile industry for the spontaneous oil/cotton heating risk has not proved sufficiently adaptable. The increasing use of pyrites for sulphuric acid manufacture is mentioned as a possible source of additional fire outbreaks through spontaneous heating. The Joint Fire Research Organisation has studied the risk associated with heaps of pulverised iron pyrites and concluded that some heating will inevitably occur if air has access. Freedom from moisture will considerably reduce the risk of dangerous heating. The risk of actual fire outbreak depends upon the presence of combustible materials such as timber; if such material is in contact with a heap of pyrites, a definite fire hazard cannot be disregarded.

A particularly important development in the field of fire research is the discovery that droplet size in water sprays can play an influential part in the extinguishing efficiency of sprays, and that the nature of this influence varies with the nature of the volatile liquid that is burning. This has already been discussed (see THE CHEMICAL AGE, 1954, **70**, 1342) and it is of obvious importance to the chemical industry, particularly for the new heavy organic branches. The design of permanent spray installations is likely to be affected by this accumulated knowledge. In any factory where the principal fire-risk is a flammable organic liquid, the automatic spraying equipment should deliver a fine or coarse spray according to the nature of the liquid. Another aspect of using water as a fire-extinguisher is the addition of wetting agents to increase the extent and rate of penetration. This is being investigated, though at present a limited number of experiments with one wetting agent has not shown that water's extinguishing efficiency is increased. It is pointed out that further research is needed, however, before this negative conclusion can safely be drawn.

A particularly chemical item in the report is the investigation of the fire risk of mixtures of sodium chlorite and sodium sulphate. These substances are used in the electrolytic process for producing chlorine dioxide, a substance of new importance since it can be used instead of the medically suspect agene (or nitrogen trichloride) in flour bleaching. It has been found that the mixture possesses a marked fire risk, equal to, if not greater than, the risk of a similar mixture with chlorate. The risk is appreciable even if the normal 1 : 2 mixture ratio is reduced to 1 : 5 (chlorite : sulphate). Since recognition of a danger is the first step in preventing its conversion from potentiality into actuality, this verdict, though a severe one, should be of good service to the expanding chlorine dioxide industry. The Report contains a useful amount of statistical information about fires, including an analysis of fire causes for a one-in-four random sample of all 1952 fires attended by UK fire brigades. An interesting result from the statistical examination of special fires shows that the introduction of cellulose acetate film in the place of cellulose nitrate film, a change that started to become fairly common only in 1950, has already reduced the rate of fire incidence in cinemas. This, of course, is another example of chemical knowledge being put to good purpose for fire prevention.

This review of fire research in 1953 is not exclusively devoted to fires with chemical causes or chemical remedies. Our own interest naturally implies a selective bias.

Notes & Comments

Fireproofing

MAKING cotton fabrics less inflammable is an important objective, for each year there are many casualties, some of them fatal, from burning clothes. A new organophosphorus compound developed at the US Southern Regional Research Laboratory seems far superior to any previously known anti-flame substance. This is tetrakis(hydroxymethyl)phosphonium chloride, $(HOCH_2)_4PCl$, and it has already been given the shortened name THPC. It is produced by a reaction between phosphine, formaldehyde and hydrochloric acid; and one American company has begun manufacturing it on pilot-scale for experimental supplies. Unlike some of the anti-flame chemicals now used for treating cotton, THPC is not water-soluble and is therefore not lost in laundering; tests of THPC-treated cotton fabrics after as many as 15 launderings have shown that the standard flame test can still be passed. Another advantage claimed for THPC is that it does not reduce the tearing or breaking strength of cotton fabrics at all appreciably; and it appears to give improved crease-resistance.

Cottoning On

THPC is not the single operative substance in the new treatment. THPC's capacity to make cotton flame-resistant was discovered in research on the properties of aminised cotton; the compound combined with the amino-groups sufficiently firmly to be stable even to boiling caustic soda solutions. To treat raw cotton with THPC aminising chemicals must also be present. For this purpose a mixed solution of triethanolamine, methylolmelamine, and urea was eventually found to be the most effective. A typical experimental formula for the new cotton treatment solution is given as 15.8 per cent THPC, 9.5 per cent trimethylolmelamine, 9.9 per cent urea, and 3 per cent triethanolamine. Any substantial development of this process in the cotton industry will therefore create a large scale demand for these chemicals as well as for THPC. Triethanolamine is an essential stabilising component, for without it a solution of THPC with the other two substances polymerises to a thick liquid or gel within a few hours at ordinary temperatures. Fuller details of this new and potentially important development will be found in *Ind. Eng. Chem.*, 1954, **46**, [6], 15-17A.

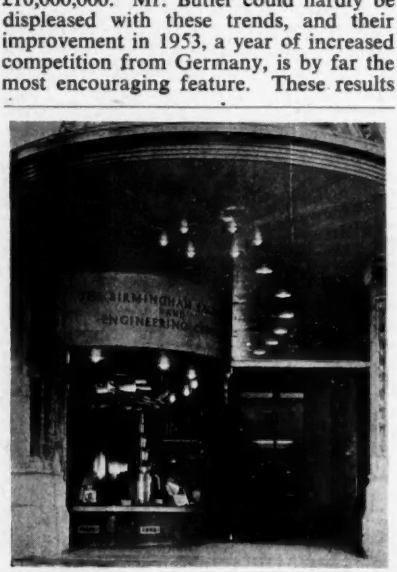
Trading Pattern

IN the June issue of *The I.C.I. Magazine* a member of I.C.I.'s export department has analysed the overseas trade of the company. The facts that are brought out, particularly in regard to the currency-earning pattern of this large slice of our chemical export trade, deserve external as well as internal publicity. In 1953 the sterling value of I.C.I.'s export sales fell by seven per cent on 1952; nevertheless, the figure was £58,200,000, which is certainly far from a drop in the commercial ocean. But any decline in quantity was compensated—at any rate in the national sense—by 'a rise in quality,' by a marked improvement in the export trade pattern. Dollar-earning sales increased substantially; and sales to EPU member-countries also rose, which is no less important in view of the fact that surplus EPU balances earned by Britain are paid in gold. The dollar-earning export trade rose by £3,000,000; EPU trade by £2,000,000. These are fine achievements in a year when the overall volume actually fell. The principal products exported to the United States were urea, metals and Alkathene. Total export trade for plastics, incidentally, has risen from £1,000,000 to £6,000,000 since 1947! And since 1951 I.C.I.'s overseas sales of urea have trebled in tonnage. A point which is clearly revealed in the analysis of I.C.I.'s exports is the importance of new products. 'Alphanol,' nonanol, and phenol —all fairly new export products of Billingham—have risen from £13,000 to

£316,000 since 1951; the new pharmaceutical product, 'Mysoline,' brought in £100,000 in 1953, its first year of export sales. Obviously these newer sources of revenue make a most fortifying contribution to the total export turnover, and they are likely to achieve higher rates of future expansion than older products.

Most Encouraging Features

THE currency-earning pattern of I.C.I. exports has changed favourably since 1949. Though the dollar share is still small (approximately 13 per cent), it has risen from £1,000,000 in 1949 to £7,500,000. Sterling area sales were 57 per cent of the total export trade in 1949; in 1953 they comprised 53 per cent, a fall in proportion, though in fact the sterling total had risen by over £10,000,000. Mr. Butler could hardly be displeased with these trends, and their improvement in 1953, a year of increased competition from Germany, is by far the most encouraging feature. These results are not only a tribute to production policy and production economics; they are equally a tribute to the overseas representatives, for the easy days of sellers' markets have gone and there is little business to be had for the asking.



Entrance to the new Birmingham Exchange and Engineering Centre, which was opened on 17 June. The centre, which is in Stephenson Place, was established at a cost of more than £30,000 to become Britain's only permanent engineering exhibition. More than 200 exhibitors have taken space, and they are to be encouraged constantly to change their exhibits

All Comes Out in the Wash

TESTING the efficiencies of detergents is difficult because 'wetting' does not depend only upon the properties of detergents—the interaction of a surface active substance and dirt is also influenced by the properties of the solid particles. Comparative testing requires a standard 'dirt.' A recent report (*Chem. & Eng. News*, 1954, **32**, 2271) suggests that graphitised carbon black may provide the answer to this problem. Some 20 years ago it was found that carbon black could be considerably graphitised if heated in absence of air at temperatures between 2,700° and 3,000°. The product was called 'Graphon' but although some use was found for it in making conductive rubbers its commercial development gradually faded. It has, however, remained a material of considerable interest to workers in surface chemistry as it has an unusually well defined surface. Its heat of immersion rises steadily with increasing adsorption, starting from a relatively low value; in contrast, most substances start with high heats of immersion that fall with increasing adsorption until the heat value of a water surface is reached. If wetting is to be measured by the 'heat of wetting,' this unusual property of graphitised carbon black offers an exceptionally flexible range of variation. Samples of 'Graphon' with controlled but varying water-adsorptive capacities can be prepared, and it is these materials which may be developed in future as consistently behaving 'test dirts' for measuring detergent performance. The remaining difficulty would seem to be that heat development is not caused only by water adsorption. There is also some heat of adsorption caused by the penetration of the detergent itself, and variations in the heats of adsorption of different detergents must be allowed for if total heat measurement is to give a genuine comparison of their wetting powers.

New High-Pressure Hydrogenation Plant

Another Step Forward by Marchon Products Ltd.

DURING the past few years the rapid growth of Marchon Products Ltd. has aroused a great deal of interest, admiration and perhaps even envy from other members of the British chemical industry. From very humble beginnings Mr. Frank Schon and Mr. Frederick Marzillier, the founders, have built up a large and prosperous business which appears to be still growing by leaps and bounds. Only last year a new phosphoric acid plant was installed at the company's 250-acre site at Whitehaven and last week a £500,000 high-pressure hydrogenation plant was officially opened. Next year a 75,000 tons per year sulphuric acid plant will be put into operation by the associated company, Solway Chemicals Ltd. From a two-man business located in a tiny office in London in 1939, an organisation has developed which regularly employs 1,200 and which, when present projects are completed, will be worth several million pounds.

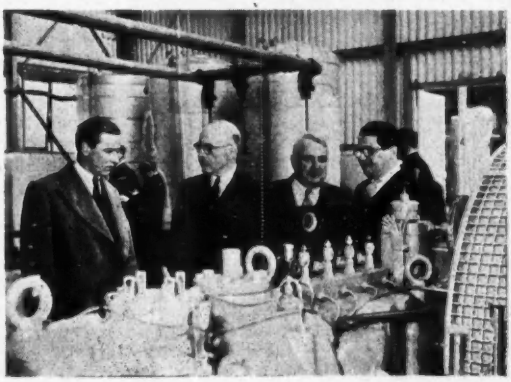
The main programme over the first two or three post-war years was designed to increase the production of surface active agents. At first the company purchased all of its raw materials from outside sources, many having to be imported, but recently they have undertaken the production of their own raw materials. This has already led to the manufacture of phosphoric acid and complex phosphates and to the building of the high-pressure hydrogenation plant which will produce fatty alcohols. The company's production of basic raw materials and finished chemicals is steadily growing.

At a luncheon held in the works at Whitehaven on 22 June, following the official opening of the new plant by Sir Henry Tizard, Mr. Schon said:—

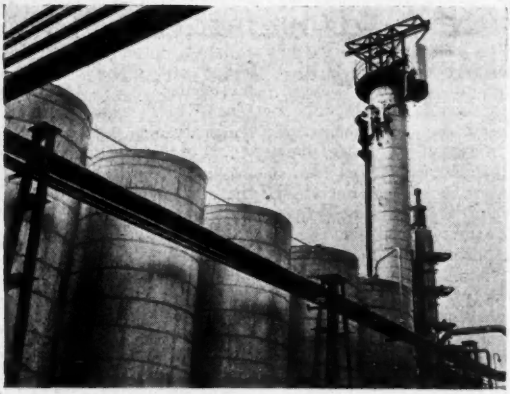
'The starting up of our high-pressure hydrogenation plant, which in the first instance has been designed by us to produce primary fatty alcohols, emphasises our growing interest in the manufacture of detergent raw materials. We are already producing on a fairly substantial scale complex phosphates which are by weight the most important ingredient in modern detergents, and the importance of our phosphate production will become still more apparent when our plant to produce sulphuric acid from anhydrite, now in its third and last year of construction, will come into operation. This is scheduled to take place early next year, the annual production rate being 90,000 tons of sulphuric acid with cement as a co-product.

'Her Majesty's Government has shown an interest in the sulphuric acid plant, which is owned by Solway Chemicals Ltd., an associated company of Marchon Products Ltd. On the recommendation of the Treasury, Sir Henry Tizard has been appointed to the Solway board, as one of the two Treasury directors.

'I am very happy in the knowledge that Sir Henry, one of the most prominent



Inspecting the new Marchon plant. From left to right: Lord Lonsdale, Admiral of the Coasts of Cumberland and Westmorland; Sir Henry Tizard; Lord Adams, Director of West Cumberland Industrial Development Co. Ltd.; Mr. F. Schon, chairman and managing director of Marchon Products



A section of the high-pressure hydrogenation plant

British scientists, is giving so much of his valuable time to Solway developments, and, over and above this, also extends his interests to the Marchon field. . . .

'I want to stress the point that our high-pressure hydrogenation plant is not a particularly large unit as far as this kind of technical equipment goes. While, some 20 years ago, high pressure hydrogenation —i.e., work with corrosive materials at 300 atmospheres pressure and a temperature of 350°—was considered a major technical achievement, this is no longer the case today. Much larger units with similar features are customary, and much higher pressures have become operational routine in the manufacture of some synthetic organic chemicals. However, I hasten to claim for our plant a special feature, its flexibility. Allowing for training of expert personnel and development of sales, it should be possible within a year or so to produce from various raw materials, whether they be fatty acids or triglycerides, higher molecular alcohols at an annual rate of 4,000 tons. . . .

'Approximately 90 per cent of the shampoos sold in the UK are based on primary fatty alcohol derivatives. I am confident that we shall now be able to cater for the most up-to-date requirements of this highly developed market here and abroad. . . .

'In the United States the anionic organic detergent constituent is provided both by alkyl aryl sulphonates and primary fatty alcohol sulphates. So far, we have seen in the United Kingdom in this particular aspect a pre-eminence of the alkyl aryl sulphonates, although the UK is in a less favourable position than the USA as a producer of petroleum derivatives. There is no doubt that in many respects America leads the world in the technological development of chemicals from petroleum. Her enormous internal petroleum consumption and her control of petroleum raw materials have given full scope to the flair of her technicians for the rapid development of this new industry.

'On the other hand, I think it may be argued with similar justification that within the sterling area as a whole, and within the British Commonwealth in particular, sufficient quantities of vegetable and animal oils can be found to make out a strong case for the utilisation of primary fatty alcohol derivatives in the anionic constituent of detergents. Going beyond this economic consideration, I feel that it is also logical to assume that primary fatty alcohol derivatives are at least as efficient as alkyl aryl sulphonates. All this leads me to believe that within a rapidly expanding detergent market there will be a growing demand for primary fatty alcohols and their derivatives.'

Sir Henry Tizard, in the course of his speech, said:—

'It has given me great pleasure to come here today to open the new plant for the manufacture of fatty alcohols and similar products. This marks a definite stage in the development of the enterprise of Marchon Products Ltd. This is a case where one can use the word "enterprise" in its literal meaning. For anyone who takes a look round these works cannot fail to be astonished that it has been possible in the difficult

years since the war to build up a chemical industry of this size and importance in such an apparently unpromising situation. I think we shall all agree that Mr. Schon and his colleagues on the Marchon board have good reason to be proud of what they have done and what they are doing.

'It has often been said before, and it cannot be repeated too often, that the whole future of this country depends on its export trade. If we cannot more than hold our own in the world's markets we are doomed to decay. . . . I am told that over one-third of the production of Marchon Products Ltd. is exported annually, and that a large proportion of this goes to so-called hard currency countries which fortunately are now showing a tendency to become much softer. To export one-third of the whole production is a great achievement; it is only possible by technical efficiency and by business enterprise and good judgment. . . .

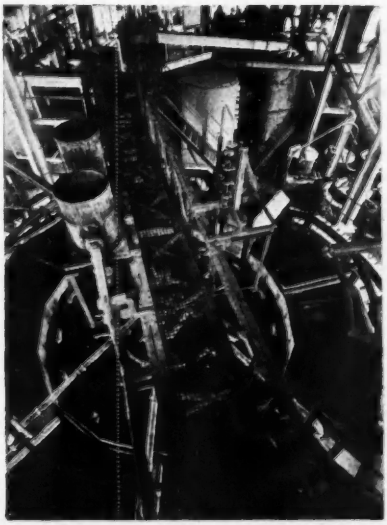
Features of Interest

'As to the particular plant we have opened today, there are some features of interest which I might dwell on in extension of what Mr. Schon has said himself. He says, quite rightly, there is nothing fundamentally new about it. I think I am right in saying that high-pressure techniques in the chemical industry started just 40 years ago when the first ammonia synthesis was brought into operation. I remember very well myself when I was working in Nernst's laboratory in 1909, Nernst and Haber were having a difference of opinion about the ammonia equilibrium. I never thought then that this was the preliminary work which led finally to an industry of such world importance.

'It was a notable technical achievement to operate a continuous process then which involved a pressure of 400 atmospheres at a temperature of 400° when there was so little experience of the strength of metals under those conditions, or of the nature of catalysts. Since then our knowledge of materials and of catalysts, on the right choice of which the success of the chemical industry depends so greatly, has increased enormously as a result of pure research in the universities, and of ardous and often disappointing work in industrial laboratories. But there is much to be done yet. There is a great deal that we do not understand. Why, for instance, copper chromite, with the inevitable traces of other metals, should be the best known catalyst for the hydrogenation of esters of fatty acids to fatty alcohols, I have no idea. . . .

'However, there was one sentence in Mr. Schon's speech which I have no doubt you noticed. He claimed for the new plant a special feature, namely, its flexibility. That is a very important claim which I believe to be true, and it could not have been achieved without clever design in detail. It seems to me that there is a general moral in that phrase. Flexibility must be our motto as a country. If we look to the future we must expect the nature of our export trade to be continuously changing More and more it will depend on the production of new products founded on new knowledge; in other words, it must represent to an ever growing extent the latest applications of science.

'In my Messel Lecture two years ago I pointed out that in spite of the undoubted triumphs of the British chemical industry, we had not succeeded for many years in expanding our proportion of the world overseas trade in chemicals. Since then I believe there has been a marked improvement, thanks very largely to the fact that it has



Phosphoric acid filter, with section of the phosphoric acid plant, at Marchon Products

been found possible to make considerable sums of money available for the investment in modern plant and modern processes. The spirit of adventure in the chemical industry is noticeably increasing. The particular plant in which we are interested today represents, of course, only a very small part of this total investment and total adventure; but it is an important part, because it will make available in this country products for which we have had hitherto to rely largely on foreign countries to supply, and which are going to find ever growing application in industry as a whole.'

The special feature of the Marchon plant is that it has been designed for maximum flexibility and can use as raw materials vegetable oils, tallow, fatty acids, or fatty acid esters. The crude alcohols produced can then be purified.

Design of the Plant

All the raw materials and final products are solid under atmospheric conditions and are corrosive to mild steel, so the plant has been constructed in stainless steel and aluminium, and all tanks and pipelines are steam traced. The plant can conveniently be divided into five main sections, each of which can be operated separately, although the whole is run as a continuous unit.

The first section is concerned with the manufacture of the catalyst, which is essentially copper chromite containing traces of other metals. Copper nitrate is first made by dissolving copper in nitric acid in a continuous system; ammonium dichromate and ammonia are then added to the copper nitrate, precipitating copper dichromate, which is filtered off under vacuum and carefully washed with water. After drying, the copper dichromate is roasted in a continuous kiln at a very closely controlled temperature in order to produce the required copper chromite catalyst.

Hydrogen is produced in the second section of the plant. This hydrogen is made by electrolysis of dilute caustic soda solution in cells of the Knowles type. The direct electric current for the electrolysis is supplied by mercury arc rectifiers fed by alternating current from the grid. The purity of the hydrogen is important, and this is recorded continuously by an automatic analyser and the hydrogen gas is then stored in a mild steel gas holder before passing to the hydrogen plant.

In the third section of the plant the fatty acid esters are manufactured by reacting together fatty alcohols and fatty acids. The reactor consists of a stainless steel column heated to the requisite temperature by Dowtherm from a fully automatic oil-fired Dowtherm boiler. The column is arranged for continuous removal of the water of reaction, and the completeness of reaction can be controlled.

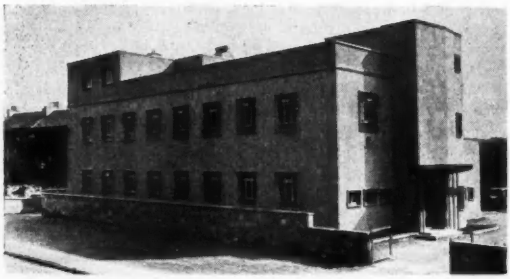
The actual hydrogenation takes place in the fourth section of the plant. Here the esters are mixed with the requisite amount of the catalyst to form a paste. This paste is pumped by special pumps at a pressure of 4,000 to 5,000 psi. into stainless steel lined autoclaves. Excess hydrogen, compressed to the same pressure, is fed with the ester into the autoclaves and the reaction converting the ester into fatty alcohols takes place at around 300°, this temperature being maintained by electric and Dowtherm heaters. The excess hydrogen is then separated off in a high-pressure separator, cleaned, recompressed, and recycled to the incoming hydrogen stream. The mixture of fatty alcohol and catalyst is reduced in pressure through a series of valves and passed to flash tanks at 100 psi. The catalyst is removed by filter presses and the crude lauryl alcohol pumped to intermediate storage tanks. About 90 per cent of the recovered catalyst is recycled, the other 10 per cent being discarded.

In the fifth section of the plant the crude alcohols pass to a fractionating column which consists of a boiler and distillation tower packed with rings. The boiler is heated by Dowtherm vapour and the column works under high vacuum maintained by a triple stage steam ejector. The fractionating tower is so designed that it can produce any specific fatty alcohol at a purity of over 99 per cent. Half the final product alcohol then goes back to the ester plant for the production of the initial ester, the other half going to the aluminium storage tanks.

Baluchistan Coal Deposits

Two German and two Pakistani engineers are undertaking an extensive survey of coal deposits in the Baluchistan Province. They have left Karachi for Quetta to explore the possibilities of mechanising the coal mines and developing them on modern lines. Their report will be submitted to the Pakistan Industrial Development Corporation.

New Laboratory Building for SAI



A view of the exterior of the new building

INAUGURATION took place on 25 June of the recently completed research and development laboratories of Scottish Agricultural Industries Ltd., at Leith. After a tour of the laboratories, guests assembled for luncheon at the George Hotel, Edinburgh, where the chair was taken by Sir William Gavin, M.B.E., chairman of SAI. Professor James Kendall, President of the Royal Society of Edinburgh, and Mr. J. Marshall, President of the Scottish NFU, spoke after lunch.

The main block of the new establishment is on two floors, comprising laboratories, workshop, storerooms, library, offices and cloakrooms. Alongside, a single-storey building is used for semi-scale and small pilot plant operations. The main structure is strong enough to take a third storey if required, and part of the roof is already occupied by a steward's flat.

The floors of the laboratories are finished with hard wood blocks; terrazzo is used in the hall, staircases and cloakrooms, while floors of the library, offices and corridors are covered with linoleum squares.

Each laboratory has its own balance room, furnace bench, titration bench and set of fume cupboards with independent extractor fans. Artificial lighting is normally supplied by central fluorescent tubes, but additional tubes can be switched on locally to give 25 foot-candles at bench level.

Heating is by hot water pipes embedded in concrete under the wood block floors and also by the warm filtered air supplied to each laboratory. The four laboratories are named general chemistry, chemical engineering, development and physical chemistry, but this serves merely to indicate the general nature of the equipment each contains and does not necessarily describe the type of

Some of the diverse equipment in the development laboratory

work being carried out. The physical chemistry laboratory has an X-ray diffraction unit in a lead-lined annexe and a darkroom.

Each laboratory is designed for a group of about five workers. Graduate recruits join one of these groups for one or two years as a preliminary either to production work or to further research. Some members of the department are seconded to one of the company's factories to gain practical experience by working closely with factory staff on works experiments.

SAI is the leading representative in Scotland of the manufacture of superphosphate and compound fertilisers. The importance of this industry to British agriculture can be gauged from the fact that last year purchases of fertiliser in the UK amounted to no less than £63,000,000 of which at least £10,000,000 was spent by Scottish farmers. SAI produces two-thirds of the fertilisers made in Scotland and distributes about 500,000 tons annually.

Mineral Resources

Progress in Geological Survey, 1953

THE Report of the Geological Survey Board and the Report of the Director of the Geological Survey and Museum for 1953 were published this week in one volume by HMSO.

During the year the Geological Survey has carried out a great deal of consultative and advisory work on problems of exploration, planning and production in the coalfields, on the investigation of other mineral deposits, on resources of underground water-supply and on civil engineering problems. This consultative work has occupied a large proportion of the time of the staff.

The variety of the practical applications of the Survey's work can be indicated by a few of the many topics mentioned in the report: a National Coal Board drilling campaign in the Bristol-Somerset coalfield; a report on the relation between coal-seams in the Neath and Dulais valleys of South Wales, in connection with plans for a new colliery; long-term plans for the development of the Midland iron-ores; mapping in the Cheshire salt-basin; prospects of renewed lead and zinc mining in Derbyshire; and Scottish hydroelectric scheme.

The recent publicity given to the possibilities of commercial atomic power had increased the interest shown in prospecting for radioactive materials in many parts of the world. The Atomic Energy Division of the Survey has carried out, in addition to fundamental research on radioactive elements and the production of reports on submitted samples, a substantial amount of radiometric prospecting.

The uranium resources discovered in this country, mainly in Devon and Cornwall, are as yet insufficient to justify the construction of a plant to treat the ore. Such a plant would cost about £250,000 to construct. Efforts are therefore being made to discover further sources. Investigations have been made at the former uranium mine at South Terras and at copper mines near St. Just. A new discovery of uranium ore was made at Wheal Bray on Bodmin Moor.

A comprehensive radiometric survey has been made of old mine dumps throughout Devon and Cornwall to ensure that good uranium ore present in the dumps is not disposed of as road-metal, as has happened in the past. In Warwickshire a thin coal seam was found to have a high uranium content. It has been suggested that exploration for uraniferous coals might be undertaken.

Many roads in the Midlands have been found to be metalled by a uranium bearing slag which is highly radioactive. This discovery was made during the testing of car-mounted Geiger-counter and scintillometer equipment designed for radiometric survey in the Colonies. The slag was a product of the smelting of naturally radioactive phosphate rock to elemental phosphorus. The uranium is not present in quantities which would make recovery worth while but the slags have proved a cheap source of radioactivity for the training of air-raid wardens.

'Summary of Progress of the Geological Survey of Great Britain and the Museum of Practical Geology for the year 1953,' published by HMSO for DSIR. Price 3s., by post 3s. 2d.

Holiday Closing

The works of Howards of Ilford Ltd. will be closed for the annual holiday from Saturday, 17 July, to Monday, 2 August, inclusive.

The works of the Leyland and Birmingham Rubber Co. Ltd., of Leyland, Lancs., will close on Friday night, 16 July, and reopen on Monday, 2 August for the annual holidays. A small staff will be on duty in the office to deal with urgent correspondence.

Lowest Recorded Accident Figures

Annual Report of the Chief Inspector of Factories

THE Annual Report of the Chief Inspector of Factories (Sir George Barnett) for the year 1952 has been presented to Parliament and was published last week. In his introduction to the report the Chief Inspector states that the staff of inspectors had been practically brought up to the full authorised complement for the first time since the war. The tendency to seek the advice of the department, particularly when starting new factories or departments or introducing new processes and installing new plant, continued to follow the trend of post-war years, and much of the time of all the staff had been spent on that type of work.

A review is given of industrial developments over the year. Reports from all districts had shown that mechanisation of plant, and in particular, mechanical handling, continued to receive increased attention in all types of industry. Many examples were quoted indicating the beneficial effect of these modern developments on conditions of work generally. These included the group operation of machine tools in engineering works engaged on mass production lines, and complete mechanisation of line process operations in the tinplate and allied industries, with the elimination of manual handling at all intermediate stages of production.

Handling of Dust

The more general adoption of fluidisation processes might well contribute to the solution of some safety problems involved in the handling of dust. One very obvious advantage of the system was that the risk of dust explosion, which was so high when inflammable dust and powders were transported by bucket conveyors and elevators or by orthodox pneumatic processes, was almost eliminated.

The rapid increase in the use of scientific instruments in the chemical, gas and petroleum industries had introduced a new risk which had not been fully appreciated by many makers of instruments or control gear. The number and variety of electronic appliances in industry continued to grow rapidly, and it was now widely recognised by the manufacturers and the users alike, that much thought was necessary on the problem of adequately training personnel to maintain this sort of equipment.

X-rays, gamma rays and beta rays were used by more and more firms, but there had been practically no change in the number of factories doing luminising with radioactive luminising paint. Nor had much use been made of the radio-isotopes available and suitable for tracer work except in research laboratories attached to factories, or in the laboratories of the research associations.

Ionising Radiations

The use of ionising radiations had become so extensive and widespread that it had been found expedient to publish a pamphlet 'Precautions in the use of Ionising Radiations in Industry' collating details of the precautions necessary to safeguard the health of the workers concerned (see THE CHEMICAL AGE, 1953, **69**, 963).

An arrangement had been made with the Atomic Energy Research Establishment, Harwell, and the Radio-Chemical Centre Amersham, for them to send to the department weekly reports giving details of each delivery of radioactive materials they made to industry. Besides enabling a general picture of industry's use of radioactive substances to be built up, it would enable District Inspectors to be notified of factories using them, so that advice and help in storing, handling and using these materials in the safest way could be given at an early stage.

In 1952 the numbers of fatal and of non-fatal accidents in factories—792 and 176,718 respectively—were the lowest recorded since the Factories Act, 1937, came into operation. The slight recession in trade, particularly in textiles, and the reduction of 2,429 accidents in that group of industries (21 per cent less than 1951) may have had some bearing on this, but a reliable guide to the progress achieved is afforded by the reduction in the accident rate, from 30 accidents per 1,000 persons employed in 1937 to 22.5 in 1952, a reduction of 25 per cent.

'Annual Report of the Chief Inspector of Factories, 1952'. (Cmd. 9154). HMSO. 6s. 6d.

Industrial Safety

While welcome reductions had been reported in many categories of accidents these results could not be improved upon or even maintained without constant endeavour. The only groups to show an increase were the two transport categories—railways and other vehicles. It is pointed out that the rapid growth in the numbers of mechanically propelled vehicles of all kinds had presented factory occupiers with problems which called for careful attention.

The most striking reduction was in accidents caused by power-driven machinery, where the rate per 1,000 persons employed dropped from 5.91 to 3.71. Transmission machinery produced, in 1952, less than half the number of accidents that occurred in 1937. On the other hand accidents at prime movers had almost doubled. The report says that the steady increase in this category was clearly unsatisfactory and that the safeguards of plant should receive much closer attention on the part of factory managements. Accidents at woodworking machines also showed no reduction.

Accidents due to sepsis were less than one-half of those in 1937 and there had also been a reduction in the rate of accidents arising during the handling of goods over the same period.

Adequate Publicity Necessary

The Chief Inspector says that it is of fundamental importance, if accidents are to be prevented, that the causes be known and it is therefore necessary that there should be adequate publicity for accidents. He urges upon industrial associations, trade unions and managements the necessity for giving as wide a circulation as possible to 'Accidents —How They Happen and How to Prevent Them.' This quarterly journal published by HM Stationery Office describes some of the accidents notified to factory inspectors, covering a wide range of operations and processes at factories, docks and building operations, and works of engineering construction. Readers are kept informed of recent publications and matters of interest in the industrial accident prevention field.

Examples are given of the success in eliminating avoidable accidents in firms with active accident prevention organisations. In a chemical works the frequency rate of accidents had gone down during the last five years from 4.0 to 2.41; in a motor vehicle works the rate had been cut by 50 per cent, and in a steel tube factory the frequency rate had fallen from 3.3 to 1.8.

Managements are asked to bear in mind that the accident problem is not necessarily disposed of by the appointment of a safety officer, or by the establishment of an Accident Prevention Committee. Inspectors' reports refer to factories where the meetings of the Accident Prevention Committee tended to be purely a formal gathering for the 'exchange of platitudes.'

During the year there were 446 accidents at conveyers, only 0.3 per cent of all factory accidents, but they were important as a class because of the severity of the injury usually incurred and because of the prevailing low standard of safeguarding of the various danger points.

Injury to the Feet

During the year 28,045 accidents—practically one in six—involved injury to the feet. Contributing factors were inadequate fencing of machinery, unskilled use of vehicles, lack of tidiness on the factory floor, neglect of the floor surface and bad methods of handling articles of every kind About three-quarters of all foot accidents occurred as a result of articles being dislodged or being dropped during handling, but the great majority of these must be regarded as an inevitable hazard of factory life. It was nevertheless a hazard which every worker could guard against by the simple expedient of wearing safety footwear. The opinion was widely held among inspectors that the standard of footwear worn in the factory had deteriorated. The Chief Inspector reports:

'The clog and the old-fashioned stoutly made boot were no doubt out of place on the dance floor and even in the factory they did not give the same measure of precaution against falling articles as does a modern safety boot; at least they had solid soles which resisted penetration by needles and broken glass and materials with sharp edges. It might have been hoped in these more enlightened times that workers would have adopted footwear which combined greater comfort with greater safety; but instead the clog and the stout boot have been discarded and all too frequently last year's Sunday best shoes are thought adequate for wearing out

in the factory. This is the height of stupidity.'

The inspectors estimated that no less than two out of every three of these accidents to feet, that is 19,000, might have been prevented by safety footwear. An example is quoted of a man's foot being run over by an 8-ton bogie and being saved by wearing a safety boot.

There were 22,080 accidents caused by falls, of which 2,079 or 9.4 per cent were falls from ladders. Falls caused by defective ladders and by slipping ladders accounted for nearly 40 per cent of the total of ladder accidents, two categories of accidents which ought not to happen. There was no doubt that workmen subjected themselves to avoidable risk when using ladders, but it was clear that the whole subject was one to which managements generally could profitably devote particular attention.

There had been a disquieting increase in the number of accidents connected with the use of mechanically propelled vehicles (other than locomotives and rolling stock) since the war, from 1,369 in 1937 to 6,333 in 1952. Many avoidable accidents occurred for the same sort of reason that accidents occur on roads: careless driving by trained drivers; unskilled driving; lack of maintenance of vehicles; badly secured loads; unsuitable terrain; and negligence by third parties.

Supervision of Young Persons

The inspectors' reports disclosed examples of serious lack of appreciation of what is meant by adequate supervision of young persons. Of this the Chief Inspector has this to say: 'managements must take as axiomatic that all workers, and young persons more often than others, are liable to do foolish things at some time or another. Anyone who believes that a young person can come into a factory fully equipped like some Minerva springing from the head of Jove, with a thorough knowledge of what is safe and what is dangerous is himself living in a fool's paradise. Young persons have to be taught, and others must stand over them until it is established that the lesson has been learnt.'

There was no evidence to show that older people were more liable to accidents than workers in the prime of life. On the contrary, at any rate as far as workers in factories were concerned, the risk of injury seemed to decline as age increased. There were 12,832 accidents to persons aged 60 and over, slightly over 95 per cent being to men.

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Separate chapters of the report are devoted to accidents in foundries, building operations and engineering construction. As an example of the lack of thought for the safety of others the report describes how a moulder, asked by his foreman to demonstrate the circumstances in which he had succeeded in dropping a box on his neighbour's foot, forthwith proceeded to drop another box on the foreman's foot.

Unfortunate Voltage

Another chapter also deals with electrical accidents. It is stated that we were relatively unfortunate in this country in that a mains voltage of the order of 240 V had been chosen as the usual voltage of supply and there was no doubt that the most effective method of minimising electrical accidents would be by reducing the voltage locally to about half that of the usual public supply voltage.

There had been little variation during the last five years in the number of fires resulting in cases of personal injury. In 1952 there were 419 non-fatal and 12 fatal accidents. Many of these distressing incidents had arisen because of widespread failure to appreciate the dangers inherent in inflammable liquid even when only small quantities were present. Considerable attention had been paid during the course of the year to the installation of suitable systems for giving audible warning in case of fire.

With the growing appreciation of the importance of industrial health, inspectors had paid increasing attention to conditions in factories, which would help to ensure healthier operatives. Apart from this routine work the department had endeavoured to foster further action by industry, where special hazards existed.

During 1952 three committees dealing with the problems of dust in card rooms of cotton mills, the problem of epitheliomatous ulceration (skin cancer) among mule spinners and dust problems in steel foundries helped the staff of the department in its striving towards better environmental conditions, the real basis of health in industry.

Industrial Safety

Inspectors commented freely upon the low average standard of compliance with the requirements of the Factories Act relating to the removal of dirt and refuse from floors and benches and for the weekly cleaning of floors. Standards of cleanliness were improving in larger factories but much remained to be done in the smaller ones which as one inspector remarked were 'seldom very dirty but rarely clean.'

Depressing Apathy

The Chief Inspector remarks that a depressing feature of the struggle for cleaner factories was the apathy of those for whose benefit the battle was waged. 'The same British public covers the parks and beaches with litter and broken bottles at holiday times, treats the floors and benches of its workplaces in the same way while at work and brings the same lack of interest to any attempt at cleaning up.'

The problems of heating and ventilation in factories were becoming more closely related as methods of heating by warm air circulation were increasingly used. Both employers and workers were usually more interested in the maintenance of comfortable temperatures than in securing proper ventilation and air movement, and aversion to 'draughts,' which frequently meant to fresh air, was proverbial.

Inspectors agreed that insufficient attention was being paid by many designers of factory buildings to the prevention of heat loss, while reduction of excessive temperature, though not a widespread problem in this country, had nevertheless to be faced in hot industries.

Progress in 1952 was particularly noticeable in two directions: the growing realisation by managements of the value of proper use of natural light, and their readiness to spend time and money on the careful planning and installation of comprehensive artificial lighting schemes for whole factories or departments. The two most common defects in artificial lighting were direct glare from badly shaded sources and insufficient illumination of outside roadways. The substitution of attractive colours for whitewash or the more sombre colours, in the internal decoration of factories, continued to gain ground.

There were 265 cases of gassing during the year. This was the highest number in any year since 1945 and was 37 more than in 1951. The Chief Inspector emphasises the necessity for much greater care in all factories where this particular hazard might be present. Carbon monoxide poisoning accounted for 108 cases, chlorine 27 and trichloroethylene 24.

Altogether there were 468 cases of industrial poisoning or disease including seven deaths. This compared with 495 cases (six deaths) in 1951. Chrome ulceration (217) and epitheliomatous ulceration or skin cancer (157 including two fatal) again accounted for the highest number of cases. There were 48 cases of lead poisoning, 16 fewer than the previous year, and for the third successive year no fatal case was reported.

Luminisers, X-ray and radio-isotope workers and workers exposed to solvents, etc., had the benefit of special regulations. Their health was in general good but the report gives details of exceptions.

The total number of voluntary notifications of dermatitis was 3,122, compared with 3,281 in 1951. Deaths from fibrosis of the lung, including silicosis, asbestosis, pneumoconiosis and byssinosis, totalled 1,905 compared with 2,037 in 1951.

Occupational Health Service

MR. TOM WILLIAMSON, general secretary of the National Union of General and Municipal Workers announced recently that his union was trying to have established an occupational health service.

Speaking at the union's congress at Rothesay, he said that it was essential to act quickly. That was especially true with the scourge of industrial dermatitis. Men who contracted it were reluctant to disclose it until it became serious, because it meant their giving up work.

Mr. W. Lamb told the congress that there was nothing in common law to force employers to do anything more than provide protective clothing. Once a worker had dermatitis it was with him for the rest of his life and the position was becoming serious.

Cancer of the lung among gas workers was referred to by Mr. A. W. Graves, who asked the union executive to investigate its incidence in the industry.

US Research on Flame Inhibitors

by A. G. THOMSON

SINCE the latter part of the eighteenth century many investigations have been made into the effect of various additives on combustible gas mixtures, but apparently it was not till 1918 that research was instituted with the specific aim of finding agents to inhibit the burning of hydrocarbons. One result of these researches was the widespread use of carbon tetrachloride as a fire extinguishing agent. An extension of this work led to the use of methyl bromide as an exceptionally effective gaseous extinguisher. Meanwhile other workers were investigating the usefulness of the so-called inert gases such as nitrogen and carbon dioxide, with the result that carbon dioxide has extensively replaced the more toxic carbon tetrachloride.

Of the compounds mentioned above, methyl bromide is by far the most effective extinguishing agent for hydrocarbon fires, but it is so highly poisonous that it can be used only in uninhabited spaces. Bromochloromethane (CBM), a volatile liquid whose vapours are comparable to methyl bromide as a fire extinguisher, is less toxic than methyl bromide, but is also unsuitable for use in inhabited spaces.

In 1933, the use of 'Freon' refrigerant gases, fluoro and chlorofluoro derivatives of hydrocarbons, as fire extinguishers was patented. According to this patent, fire may be inhibited by adding CF_4, CCl_2F_2 and similar compounds to the atmosphere in sufficient quantities without preventing the existence of human life. On a volume-for-volume basis the Freons were later shown to be about twice as effective as carbon dioxide and 3½ times as effective as nitrogen. Their relatively low toxicity both in the absence and in the presence of flame has been established. Nevertheless, the Freon refrigerant gases have not been used commercially as fire extinguishing agents, presumably because of their higher cost.

Comparison of the relative effectiveness and toxicity of the fluorocarbons and the bromo-substituted compounds has shown that the fire extinguishing abilities of the former are in approximate proportion to their vapour densities and their toxicity is quite low; on the other hand, the bromo compounds are more effective than their increased density would indicate, but their toxicity is high. It is possible that a bromofluoro compound may exist which has the combined properties of low toxicity and high flame inhibiting ability. In addition, there is a possibility of finding a completely fluorinated compound with a vapour density sufficient to make it as effective on a volumetric basis as the bromo compounds.

Workers in the United States have recently studied the effect of the addition of various fluoro, chloro and bromo compounds on the flammability limits of mixtures of air and hydrocarbon compounds, the purpose of the experiments being to compare

[*Courtesy British Paramount News*

Recent tests with chlorobromomethane as an extinguisher for aircraft fires were very successful

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the effectiveness of these materials as fire extinguishers. This investigation was undertaken by the Engineering Research Branch Chemistry Division of the Naval Research Laboratory, Washington. The findings are reviewed in a report by H. E. Moran, Jr., and A. W. Bertschey, which has been received by the Technical Information and Documents Unit of the Department of Scientific and Industrial Research.

Some bromochloro compounds and some perfluoro compounds were available as a result of Atomic Energy Commission projects and many others were synthesised. These were submitted to screening tests as fire inhibitors at the Purdue Research Foundation. Some of the compounds proved to be good extinguishing agents but lacked the desired low toxicity.

In view of the reported low toxicity of perfluorocarbons and the inherent stability of the fluorine-carbon bond, it was hoped that some of the perfluorocarbons would be found suitable for use as flame inhibitors or fire extinguishers. It was also thought that the substitution of fluorine for hydrogen in compounds such as methyl bromide and bromochloromethane might yield materials having reduced toxicities without decreased flame-inhibiting abilities.

Evaluating Ignition Prevention

One method of evaluating precisely the ability of a compound to prevent ignition of a fuel and of evaluating, at least roughly, its ability to extinguish already burning fuel is to study the effect of the compound on the flammability limits of the fuel. For the purposes of the investigation, the upper and lower limits were defined respectively as the lowest concentration of fuel vapour that would just support a self-propagating flame and that concentration which, if exceeded, would fail to support a self-propagating flame. A flame will propagate, sometimes violently, in a mixture of fuel and air in which the proportion of fuel is between the two limits. If a third non-inflammable gas is added to fuel-air mixtures, the difference between the upper and lower flammability limits will decrease until it finally disappears. Further addition of the diluent will produce a mixture incapable of propagating a flame regardless of the proportion of fuel to the other constituents.

Flammability limits are usually plotted to give a curve of fuel vapour concentration at each limit against percentage by volume of diluent gas. This results in a continuous curve beginnng and ending at zero per cent diluent and exhibiting a maximum where the upper and lower limits of flammability meet. The proportion of diluent present at the peak of the curve is taken as a criterion of the effectiveness of the diluent gas as a flame inhibitor.

Although such limits have been reported before, the methods of determination have not been shown to be free from the influence of the design and operation of the apparatus. The method used in the investigation under review was developed by the US Bureau of Mines and gives flammability limits which are entirely a property of the gas mixtures tested.

Construction of Apparatus

The main component of the apparatus is a vertical tube 5 cm. ID and 150 cm. high, which is equipped with a tungsten electrode spark gap about 10 cm. from the bottom. A glass sealing plate at the bottom of the tube serves both as a closure and as a safety vent in the event of violent combustion. The top of the tube is closed except for a small-diameter T-tube, to one side of which is attached a line leading to a charging manifold and measuring manometer, and to the other side a line leading to the mixing pump. Mixing is accomplished by a mercury displacement pump with the inlet attached to the T-tube, and the discharge returns to the main tube through a side arm near the bottom. A pair of mercury filled bubblers serve as check valves to provide unidirectional flow of the fuel-air mixture. The pump is powered by compressed air controlled by solenoid valves and a relay system actuated by wires dipping into the mercury. The power for the spark gap is derived from a 15 kV, 30 mA transformer, actuated through a timer to give a spark of about two seconds duration. The entire apparatus is enclosed in a ventilated plywood cabinet with a transparent front.

In determining a point on a flammability limit curve, the apparatus was prepared by wrapping 1 to 2 mg. of guncotton round the tip of one electrode to ensure an adequate source of ignition. The tube base

was closed with a glass sealing plate and the whole apparatus was nearly evacuated. Fuel vapour and diluent gas were admitted successively, and air dried by calcium sulphate was admitted to bring the total pressure up to that of the outside atmosphere while the circulating pump was operated long enough to ensure complete mixing of the gases.

The mixture was ignited at the spark gap. If a flame travelled at least 4 ft. above the spark, it was considered as being capable of infinite propagation, a positive result being recorded.

For most of the points on the flammability curve, a series of tests was made, in which the amount of diluent gas was held constant, while the fuel gas was increased by small increments. The average of the last mixture failing to propagate and the first that propagated was taken as the lower flammability limit, the upper limit being determined in a similar manner. Near the peak, where the curve was more nearly horizontal than vertical, the procedure was altered by holding the amount of fuel constant while the diluent gas was varied in small steps. This permitted a sharper delineation of the flammable and non-inflammable mixture in the vicinity of the peak.

Possible Large Error

The curves for methyl bromide and bromochloromethane were determined by using 62-octane unleaded gasolene as a fuel. It was found that after the most volatile constituents had evaporated from a fuel sample, a less volatile material was distilled into the propagation tube and condensed to a liquid, thus introducing the possibility of a large error through undetected condensate. For further work *n*-pentane, which is readily volatile and has the same limits of flammability, was therefore substituted for gasolene.

The flammability limits for petrol in air with methyl bromide and in air with bromochloromethane vapour, and the limits for pentane vapour in air with perfluoromethane, perfluoropropane, and sulphur hexafluoride were determined.

Diluent Gas or Vapour Required to Render any Mixture of Air with Gasolene or Pentane Non-Inflammable

	lb. per cu. ft. of gas mixture
Methyl bromide ..	0.019
Bromochloromethane ..	0.027
Carbon dioxide ..	0.036
Perfluoromethane ..	0.052
Perfluoropropane ..	0.055
Sulphur hexafluoride ..	0.065

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No quantitative measurement of the decomposition of the various diluent gases was made. However, an indication of the relative extent of decomposition was obtained from visual and olfactory observations during the tests.

Of the perfluoro compounds, sulphur hexafluoride was the most easily decomposed in tests in which the flame was propagated. Dense and intolerably acrid white smoke clouds were produced, elemental sulphur was formed, and the glass apparatus was etched severely.

Greater Stability

The breakdown of perfluoropropane resulted in much less noxious fumes, but breathing was unpleasant and there was some etching of the glass, though much less than from sulphur hexafluoride. The decomposition of perfluoromethane could not be noticed during individual tests, but after several hundred tests, many resulting in complete propagation of flame, the propagation tube was very lightly etched.

On a volumetric basis the bromine-containing compounds were more effective than the others tested. If the effectiveness of a given weight of material required to suppress flame propagation is examined, it is readily apparent that the bromine-containing compounds are in a group separate from the others, but their use as fire extinguishing agents is severely limited by the toxicity of their break-down products. Sulphur hexafluoride is excluded from consideration because of the extent of its breakdown in the presence of flame.

The remaining gases—carbon dioxide, perfluoromethane and perfluoropropane—show effectiveness increasing in the same order as their molecular weight and hence density. It might be expected that a heavier gas would be more effective than a light one in actual fire conditions due to formation of a gas blanket over the source of fuel vapours and to the slower rates of diffusion of heavier gases. Additional tests are planned to verify this assumption.

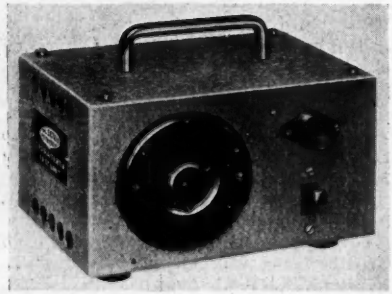
'Flammability Limits for Mixtures of Hydrocarbon Fuels, Air and Halogen Compounds', US Report 4121 (TIDU Reference 0251/8).

Safety Notebook

AT 4.30 p.m. on 24 June, employees at the Newport, Mon., factory of Monsanto Chemicals Ltd. completed 2,000,000 man-hours of work without a single lost-time accident. The factory, which employs approximately 1,000 men and women on the production of industrial chemicals and plastics, commenced its as yet unbroken accident-free run on 10 July, 1953. In 1952-53 the same factory achieved a total of 1,425,860 man-hours without a lost-time accident, but the present achievement sets up a new record for Monsanto in Great Britain.

* * *

THE terra-tertia testing unit made by Electro Methods Ltd., Caxton Way, Stevenage, is a device for rapidly testing the earth conductor efficiency of portable electric tools. The unit is connected at AC 220-250 V,



50 c/s, and the tool to be tested is plugged into the unit and pressed against the instrument's handle. When the switch is depressed, a high current at low voltage flows through the earth conductor and associate plug which, if satisfactory, light the 'Pass' lamp on the front panel. If the earthing system is faulty the lamp will not light; if the lamp is faulty, the tool will not be passed whatever its condition. A frequent danger in portable tools is the partial fracture of the earth conductor due to negligence or wear. In such cases the high test current at low voltage is sufficient to burn out the remaining strands of earth wire, thereby anticipating the failure during work. The unit is contained in a case with carrying handle, weight 12 lb., dimensions 8 by 7 by 6½ in.

THE severe effects of getting dichlorophenol on the skin had not been realised until Samuel Davies, aged 44, died after filling a drum with the chemical, it was stated at a Runcorn inquest recently. Davies, a process worker at the I.C.I. Castner Kellner works at Weston Point, was severely burned.

Dr. C. A. Hill, pathologist at the Royal Southern Hospital, Liverpool, who performed a post-mortem, said that about one-tenth of the surface of the body was affected with burns.

The absorption would be rapid and through the skin, even if antidotes were applied. It affected the heart and the central nervous system. Death was due to respiratory failure through cerebral depression due to dichlorophenol poisoning.

A witness said he saw Davies lying on his side in front of the drum which he was filling. The liquid was cascading over Davies. Davies called for the eye wash and the bottle containing methanol which was kept on the premises. Assistance then arrived. Davies complained while under the shower that he was 'going over' and he went limp. Rubber gloves, goggles, rubber boots and overalls were supplied.

The coroner, Mr. R. A. Daniel, who sat with a jury, said that the severe effects of dichlorophenol had not been realised until this unfortunate accident. The only conclusion that could be arrived at was that the drum had moved slightly and that would result in the run-in pipe not being right into the bung-hole. The employers had provided the necessary things for safety and had not been negligent in that respect.

Returning a verdict of accidental death, the jury added a rider recommending that the method of filling the drums should be made safer and reorganised in some way to prevent anything similar happening.

* * *

SOME 174 plants of 22 companies in the US operated throughout 1953 without a single lost-time accident, states a report from the Manufacturing Chemists' Association in Washington. Records show that the chemical industry established a new low accident frequency rate of 3.69 per 1,000,000 man-

hours, making it one of the safest in the nation—in fact a worker is safer in an American chemical plant than driving a car, working in the home or just walking in the street. The 1953 rate is 52 per cent below that for 1946, and figures for the first quarter of 1954 indicate an even lower rate. Established in 1951 to increase interest in industrial accident prevention, and financed by a gift to the MCA by the late Lammot du Pont, the Lammot du Pont safety plaque awards will be presented to Rohm & Haas Co., of Philadelphia, and Sunkist Growers Inc., Ontario, California

* * *

A UNIT of the Medical Research Council has completed its investigations into the incidence of chronic cadmium poisoning at a copper refinery at Prescot, Lancashire, and is preparing a report. Mr. J. R. Bevins, Parliamentary Secretary of the Ministry of Works, stated in a written Parliamentary reply recently. He added that it would be made available to the Minister of Pensions and National Insurance, and published as soon as possible in the medical Press.

* * *

EVIDENCE given at an inquiry at Dumfries Sheriff Court on 11 June described how two men were killed in an explosion at the Imperial Chemical Industries' works, near Annan, on 11 February when they were heating a length of pipe at the burning station of the factory in order to clear away a wax deposit which accumulated during the production of a high explosive.

The men were Mr. Walter Johnston, aged 26, of 93 Friars' Vennel, Dumfries, and Mr. Harry McDairmid, aged 31, of 7 Afrikander Road, Gretna, and a formal verdict was returned.

It was stated that it was thought that the deposit contained only a harmless proportion of the high explosive, but experiments showed that the wax left in the pipes was not the same as that in the tanks from which it was originally taken. It contained a high concentration of high explosive.

Mr. Donald B. Huntingford, who was manager of the factory at the time, said the danger was now fully recognised and further safety precautions had been taken.

* * *

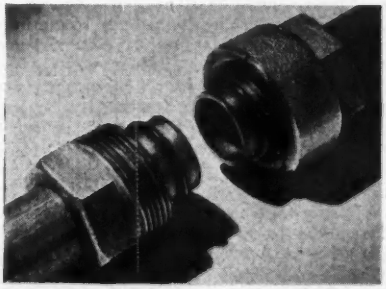
THE US Flammable Fabrics Act which came into force on 1 July is not expected to affect more than 10 per cent of fabrics and garments exported to the United States from

Safety Notebook

Britain. Mr. R. C. Booth, deputy secretary of the Manchester Chamber of Commerce, told a Press conference that this 10 per cent included the border-line or suspect fabrics which would require testing by the flammability tester, recently installed at Didsbury in the testing house. The border-line fabrics to which he referred are cheese cloths, marquisettes, lawns, voiles, organdies, tissue ginghams, outing flannels, canton flannels, flannelettes, crinolines and chiffon voiles. These fabrics were generally safe but needed checking. Mr. Booth thought that the enforcement of the Act might lead to an acceleration of research on both sides of the Atlantic and to further blending of synthetic with natural fibres to reduce the flammability.

* * *

THE many problems associated with pipe jointing in fluid installations, particularly those employing corrosive media, are effectively solved by the special couplings made by Langley Alloys Ltd., Langley, Slough. A groove is rolled in each pipe at a short distance from the end; the male and female pieces are fitted, and circlips mounted in the grooves. Finally, the pipe ends are accurately turned so that when placed in contact they correspond precisely, and the assembly is screwed together to form a joint that is perfectly sealed and mechanically secure. Since there is thus an unbroken internal surface, the coupling components need not be chosen for their corrosion resistance, and may be made up from standard materials. Couplings up to about 2 in. nominal pipe size and reducers are available.



Guide, Philosopher & Friend

Copper Development Association Comes of Age

SPEAKING at a luncheon held recently at Kendals Hall, Radlett, Herts., to mark the coming-of-age of the Copper Development Association, Lord McGowan, K.B.E., remarked that because he had been a friend of the CDA since its inception he was well aware of how successful it had been during the past twenty-one years. The membership had risen from 25 to 34, and as the years passed, more and more people, not only in this country but in many other countries, had come to recognise in the CDA a guide, philosopher and friend.

In more than one field, today, the Association was acknowledged as a leading authority, and was consulted by Government and official bodies as well as private firms and persons. The CDA technical staff were among the best in the world for the job they had to do and had at their fingertips, in the well organised reference library, a comprehensive system of information carefully culled from the world's leading publications on the subject.

As another invaluable part of its work, the CDA acted as watch-dog on behalf of the copper-using industries over a wide range of standardisation activities. Members of the staff served on more than sixty technical committees and sub-committees of the British Standards Institution.

Lord McGowan went on to say that, too often in the past, our educational institutions —fine though they undoubtedly were—had tended to look upon the technical student as a poor relation. That was an attitude of mind we could no longer afford and, he was glad to say, it was now recognised that proper technical training before a man started his working life, and continuous training during it, were two of the most important keys to higher productivity. Also, from experience gained on his frequent visits abroad, he believed that commercial salesmen in many industries must have their work supplemented by technicians to show customers how best to use the products with which they were dealing.

He made a plea, therefore, for a closer association of science with industry. The CDA could well congratulate itself on the work it was doing in that sphere. Other industries might lag behind technologically because they had never set up machinery to make the results of research known to individual concerns in their particular field. That was not true of copper. It said much for the industry that it saw the need for such machinery as long ago as 1933, and by forming the CDA took steps to meet it. The Association was performing and would continue to perform, a valuable service to British industry.

Mr. R. L. Prain, O.B.E., chairman of the council of the Association, announced the setting up of a trust fund to secure the future of the Association. The fund, which would amount to not less than £100,000, would be subscribed by the following—Roan Antelope Copper Mines Ltd., Mufulira Copper Mines Ltd., Nchanga Consolidated Copper Mines Ltd., Rhokana Corporation Ltd., and the British South Africa Company. It would be a Rhodesian trust, administered in Rhodesia by trustees representing the donors and the Association.

Weed-Killer Prosecutions

FIRST prosecutions under the Agriculture (Poisonous Substances) Regulations, 1953, which prohibit the use in agriculture and horticulture of weed killers and insecticides containing dinitro and organo-phosphorus compounds unless certain precautions are taken, were taken recently against a contractor, who was fined a total of £75, and against his employee, who was fined a total of £20.

The contractor was found guilty to (1) having no register, (2) for not supplying all the protective clothing required under the regulations, and (3) for permitting the worker to carry out spraying when not wearing protective clothing. On this charge the chairman of the court said it was the employer's duty to see that workers wore this clothing. The employee was found guilty on two charges: (1) for not wearing protective clothing, and (2) for smoking after he had just been spraying and without first washing his hands and face. The defendants stated that they wished to appeal.

Natural Gas Found in Sussex

First Results of Gas Council's Nationwide Search

NATURAL gas has been found 800 ft. down at a site at Crowborough Warren on the edge of Ashdown Forest in Sussex.

Traces of the gas were discovered last week after five weeks of drilling operations which are being undertaken on behalf of the Gas Council, but although it is too early yet to indicate what quantities may be expected to be available, the authorities concerned are hopeful that the enterprise will yield satisfactory results.

It was six months ago that the Gas Council embarked on a five-year programme, estimated to cost £1,000,000, in an attempt to find commercial quantities of natural gas in Britain.

Sir Harold Smith, chairman of the Gas Council, said last week: 'We are not building our hopes on early success too high, for in prospecting of this nature a large amount of exploration work has to be faced. The experience of those engaged in prospecting for oil is that the chances of successful borings in a new area, even if all the latest scientific aids are used, cannot be rated higher than one in five. So, even if our first efforts do not show very positive results, we shall not despair, for we have every hope that during the course of the five years success will come in one area or another.'

Sir Harold gave two reasons for this attempt to find natural gas. First, the price of coal—the gas industry's basic raw material—had increased so rapidly that it was costing about £25,000,000 a year more than when the industry was nationalised in 1949. He added that the industry was now faced with an extra annual cost of £30,000,000 due to rises in price during the last 12 months. The other factor was the increasing scarcity of good carbonising coals.

The prospecting work at Crowborough Warren is being carried out on behalf of the Gas Council by the D'Arcy Exploration Company, subsidiary of the Anglo-Iranian Co. Ltd., which has had many years' experience in all parts of the world in prospecting for oil. This process is very similar to that of prospecting for natural gas, but it is possible for gas to be found where oil is not present. Drilling operations are continuing night and day on a shift basis, and it is planned to go down to a depth of 2,000 ft.

The Gas Council's decision to invest in the project was based on a special report supplied by the Anglo-Iranian Oil Company's chief geologist.

Other survey work is now being carried on in Yorkshire and Lincolnshire, and it is hoped that additional drilling sites will be found in those areas on the basis of the reports which will be presented.

Interior of the petroleum engineer's mobile laboratory which has been installed on the site. Here rock obtained in the boring operations is tested to determine its permeability

The Export Situation

Steady Business Results in Higher Total

APRIL'S decrease in chemical exports has been made up by May's figures, the average of £16,175,804 and £18,195,801 very nearly equalling the March total of £17,273,004. Trade has remained generally steady, the increase being accounted for by a few unexpectedly large rises. Lead tetra-ethyl, for example, after a gradual decline, has suddenly jumped to a figure nearly four times that for April, accounting for a quarter of the total increase.

Coal tar has made another rise, and the fluctuation in benzole exports has remained at the upper level, so that figures for coal tar products are higher than they have been for some time, even with the sharp decrease in creosote oil. Sodium hydroxide is another product on the upward curve, and soda ash shows a commensurate increase.

Synthetic dyestuffs continue their rise, principal demands being from India and Australia, and medicinal products, although not quite up to March's totals, are high, the most important customers outside the Commonwealth being Eire, Egypt and the Argentine.

Exports to the US are down again, as (on a smaller scale) are those to Turkey, but trade with India, Australia and New Zealand continues to increase, and there is a striking rise in exports to Western Germany.

TABLE 1

VALUE OF EXPORTS IN £ : PRINCIPAL COMMODITIES

	May 1954	April 1954	May 1953
Acids, inorganic	63,611	39,425	47,747
Copper sulphate	232,700	458,759	499,570
Sodium hydroxide	637,494	330,309	270,115
Sodium carbonate	284,382	293,860	148,695
Aluminium oxide, anhydrous	45,671	11,589	1,642
Aluminium sulphate	42,060	55,908	21,709
Bismuth compounds	32,165	25,908	14,552
Calcium compounds, inorganic	70,648	56,988	52,145
Magnesium compounds	50,501	49,703	44,422
Nickel salts	58,844	54,175	70,618
Potassium compounds, ex. fertilisers, bromides and iodides	37,039	42,065	34,578
Glycerine	11,585	30,770	50 193
Ethyl, methyl, etc., alcohols	165,415	116,402	79,333
Lead tetra-ethyl	692,583	178,287	272,160
Total for chemical elements and compounds	**5,452,270**	**4,602,659**	**4,237,548**
Coal tar	293,733	84,240	107,362
Cresylic acids	46,140	39,516	58,293
Benzole	209,393	238,880	268,933
Creosote oil	55,720	155,648	122,650
Total from coal tar, etc.	**625,644**	**540,001**	**590,588**
Indigo, synthetic	104,564	81,841	109,889
Total for synthetic dyestuffs	**1,004,965**	**873,190**	**555,246**
Medicinal and pharmaceutical products, total	**2,909,251**	**2,628,559**	**2,564,635**
Essential oils—			
Natural	43,375	33,665	49,611
Synthetic	50,422	65,486	47,894
Flavouring essences, etc.	102,680	100,254	91,636
Total for essential oils, perfumes, etc.	**1,869,722**	**1,692,031**	**1,650,679**
Ammonium nitrate	13,945	14,874	143,880
Ammonium sulphate	345,496	134,606	342,985
Total for all fertilisers	**405,533**	**211,509**	**525,156**
Paints, pigments and tannins, total	**1,633,170**	**1,400,824**	**1,227,873**
Plastics materials, total	**2,018,674**	**1,904,590**	**1,573,326**

TABLE 2

VALUE OF EXPORTS IN £ : PRINCIPAL COMMODITIES

	May 1954	April 1954	May 1953
Gold Coast	324,424	314,824	302,350
Nigeria	302,882	368,522	309,898
South Africa	824,128	915,551	599,748
India	1,358,193	1,103,500	897,795
Pakistan	530,895	469,674	40,745
Singapore	289,522	246,971	296,012
Malaya	258,440	180,345	226,929
Ceylon	268,176	123,998	277,793
Hong Kong	273,992	348,402	487,208
Australia	1,447,443	1,229,865	704,114
New Zealand	534,585	428,223	388,190
Canada	652,901	773,384	761,950
Eire	601,843	530,393	621,941
Finland	269,675	272,654	194,541
Sweden	529,426	505,014	479,090
Norway	265,111	257,791	213,331
Denmark	354,543	352,060	329,194
Western Germany	666,893	287,774	196,806
Netherlands	622,911	697,376	572,318
Belgium	391,329	312,741	319,118
France	470,092	384,194	411,543
Switzerland	233,634	174,106	106,294
Italy	425,178	539,875	386,483
Spain	103,467	150,551	66,339
Portugal	162,660	231,358	135,729
Greece	95,408	56,617	143,492
Turkey	99,659	156,548	220,316
Egypt	303,973	160,678	314,366
US	648,842	856,127	951,988
Argentine	322,472	197,456	211,276
Total value of chemical exports	**18,195,801**	**16,175,804**	**14,686,057**

OIL IN THE SOVIET UNION. By Heinrich Hassman. Translated by Alfred M. Leeston, foreword by E. DeGoyler. Princetown University Press. London, Cambridge University Press. Pp. 173. 30s.

Dr. Hassman's previous books 'Oil in Germany' and 'Oil from the Middle East' are well known within the oil industry and provide an excellent evaluation of the state of the industry within these areas at the time of publication. The present book, however, has a much wider appeal because the state of the petroleum industry within the Soviet Union is of special interest to economists and politicians as well as of general interest outside the industry itself. The book has been translated into English largely because of the American interest in the Russian oil industry, but it is equally of interest in this country where over the past three years public interest in problems of world oil supplies has been quickened by the Persian oil dispute. During the period leading to the closing down of the Abadan Refinery there was much speculation in the Press concerning the possible effect of the loss of Persian oil to the Western Powers in relation to the supplies of oil available to the Soviet Union.

Dr. Hassman's book was published in Germany shortly before the Persian crisis, and contains this paragraph 'If some day the production of the Middle East, which will exceed 100,000,000 tons in the years to come, should be added to Russian oil production, presently at 40,000,000 tons, this would mean such an increase in economic power for the Soviet Union that the political aspect of the World would be altered too.' This is the answer to a question which many people asked during the summer of 1951. In the last two years the production of oil from Kuwait (3,300,000 tons in February) and Iraq (1,800,000 tons in February) has to a large extent offset the loss of Iranian oil, and the discussions now taking place in Tehran are against a somewhat different background than appeared likely three years ago. Nevertheless, it remains true that the transfer of Iranian oil to the Soviet Union would have far reaching political consequences. Why this is so is clearly shown in Dr. Hassman's book which presents a careful analysis of the oil industry within the Soviet Union and makes comparison possible with other producing areas.

The book is divided into four parts. Part I 'The Basis of the Russian Oil Industry' gives a brief account of the Soviet Union and its economy and economic theory as a background to the understanding of the problems of the oil industry within the Union. Part II deals with the development of the Russian oil industry from 1860 to 1917, and from 1917 to the present time. Part III discusses in detail the main producing areas within the Soviet Union giving details of production and refining capacity wherever possible. Part IV discusses the problems facing the Russian oil industry and in particular the extent to which the demands of the Soviet Union can be met by imports of oil from satellite countries. There is admittedly much speculation in this part of the book, but there is also much information gathered from a wide variety of sources.

The book is written primarily for the non-technical man interested or concerned with the oil industry. It is equally of interest to anyone wishing to know a little more of the complex problems involved in the balance of world oil power. At the same time it provides an interesting background of historical and political interest to those wishing to understand something of the Soviet Union. The translator, A. M. Leeston, has made an exceedingly readable book and added, in footnotes and tables, later information available to him. There is never any confusion between author and translator and the additions enhance the value of the book. The book is well printed, adequately indexed, and illustrated by 19 maps. It is highly recommended as a readable introduction to

problems of World oil supplies with a particular interest at the present time.—F. MORTON.

QUALITATIVE INORGANIC ANALYSIS By G. Charlot. Translated by R. C. Murray from the 4th French Edition. Methuen, London. 1954. Pp. xi +354. 42s.

This text has been translated from the manuscript of the 4th French Edition of 'Théorie and Méthode Nouvelle d'Analyse' due for publication this year. Analytical chemists not familiar with the previous editions will no doubt be surprised to find that Professor Charlot has made a complete breakaway from the well-established 'Group' system of classical qualitative analysis. The result is a commendable and entirely successful attempt to integrate the teaching and practice of qualitative analysis with the underlying physico-chemical principles. The reviewer, who regards qualitative analysis primarily as a means of teaching the reactions of chemistry and the methods of separation used in quantitative analysis, must, however, disagree with Professor Charlot's introductory remarks that the classical method cannot serve as a satisfactory training for a subsequent career. Of course, most students will never take up work in which their main interest is analysis, and certainly those who do so will never use the classical scheme in practice. But the student will know his chemistry from the reaction standpoint.

There will be many who prefer the physico-chemical approach and will welcome this book. The first section (131 pages) is concerned with the theoretical aspects of qualitative analysis and is admirably treated. Among the subjects discussed in the light of modern developments are acids and bases, oxidants and reductants, properties of precipitates, and indicators and reagents.

The second part of the book (188 pages) details the reactions of cations and anions in solution, with a view to their later presentation in a new scheme of analysis. A feature of this section is the inclusion of tests for many of the so-called less common elements such as the rare earths, the precious metals, niobium and tantalum.

The final section of the book is surprisingly the smallest (17 pages). The technique employed is described briefly, and is followed by a discussion of a novel method of analysis involving essentially reactions which have been made specific for each ion. A large number of cations can be detected in the initial solution, although the alkaline earths and the alkalis are detected after separation of the ions of the other groups. Although the amounts of test solution and reagent used for each test are small, the large number of tests to be carried out will in time consume considerable amounts of both. It is possible that a student will find that the scheme will become monotonous after a few analyses.

There is a definite place for this book in the literature of analytical chemistry. It provides a very well written and thorough physico-chemical approach to qualitative analysis.

The translation is excellent and at no time even borders on the literal.—A. J. NUTTEN.

BERECHNUNG DER AUSMAUERUNG STAHLERNER GEFASE. By W. Matz. Springer-Verlag, Berlin. 1953. Pp. 75. DM. 10.50.

Dr. Spangler and Dr. Matz have edited a series of books under the collective title 'Essays on Technical Processes.' The calculation of the lining of steel vessels is the first volume in this series. The Springer-Verlag is to be congratulated on the publication of this volume in spite of the fact that it is an advertisement for the acid resisting cements 'Hoechst' and 'Asplit' made by Farbwerke Hoechst. It is an excellent little book, describing the conditions for the lining of steel vessels with acid- and alkali-resisting bricks and tiles. These linings were empirically chosen but this book with its formulae explaining the connection between heat conductivity and thermal expansion and indications of the swelling of masonry is a valuable contribution to the whole problem both theoretically and practically. The book not only describes present conditions but also grapples with many problems, thereby assisting in their solution.

Dr. Matz, however, does not give engineering data on the acid- and alkali-resisting bricks which are used for the linings. I think a further contribution to the understanding of the subject could be made by including the composition of the different acid-resisting 'Hoechst' cements, which have been known for some time.—FELIX SINGER.

HOME

Swansea Lecture

'Some Aspects of Inorganic Chromatography' is the title of a lecture to be given by Dr. F. H. Pollard at a summer meeting of Western Section, Society of Analytical Chemistry, at University College, Swansea, on 17 July, at 10.30 a.m. Lunch will follow the meeting, and during the afternoon visits will be made to places of interest.

Changes of Address

The offices of Potash Ltd. have moved to Norfolk House, St. James's Square, London, S.W.1. The telephone number, Whitehall 1326, remains unaltered.

The Mercantile Holding & Trading Co. Ltd. have moved to Blomfield House, 52 New Broad Street, London, E.C.2. Telephone: London Wall 5951-3.

British Food Fair

The Third British Food Fair is to be held at Olympia from 7 to 18 July. There has been a big demand for space, and to meet requests, the stand space is to be increased by 25 per cent on previous Fairs.

Plastics Exhibition at Cardiff

Some of the latest manufacturing developments in Bakelite, Warerite and Vybak plastics will be shown at an exhibition being sponsored by Bakelite Ltd. at the Bowchier Hall, Institution for the Blind, Newport Road, Cardiff, from 6 to 10 July.

Employment in Chemical Industry

According to statistics in the Ministry of Labour Gazette for June, the total number of persons employed in the chemical and allied trades in Great Britain at the end of April was 504,200, compared with 503,300 for the previous month. Of these, 359,500 were males and 144,700 females. The number of persons in the industry unemployed at the end of the month totalled 4,965.

Celebrating a Centenary

The centenary of the birth of the Hon. Sir Charles A. Parsons, the greatest power engineer of his day, is being celebrated at the Science Museum, South Kensington, by a special display in the East Hall, of his original 7½ kW high-speed turbogenerator of 1884, by the side of a scale-model, one sixteenth full-size, of a modern Parsons 50,000 kW steam turbo-alternator.

Chemical Society's Library

From 16 July until 30 September the Chemical Society's Library will be open from 10 a.m. to 5 p.m. daily, except during the fortnight 2 to 14 August inclusive.

Magnesium Industry Council

The Magnesium Advisory Committee, formed early in 1952, has been reconstituted as the Magnesium Industry Council. It will continue the committee's actvities as a consultative and advisory body and has extended its scope through the formation of panels of technical and commercial experts. The Council's aim is to promote the production and use of magnesium and its alloys.

£2,000,000 Coke Oven Plant Opened

First of the new coke oven plants brought into production by the National Coal Board since nationalisation was opened at Fishburn, Co. Durham, on 18 June. The plant, which has cost about £2,000,000 during three years of construction, has a carbonising capacity of 1,000 tons of coal daily. Each year it will produce 250,000 tons of coke, more than 3,000,000 gal. of tar, more than 1,000,000 gal. of benzole, and about 4,000 tons of sulphate of ammonia, in addition to supplying 2,500,000,000 cu. ft. of purified gas to the Northern Gas Board.

Gas Turbine Corrosion

Encouraging experiments in the use of ethyl silicate as an additive to lessen corrosion in gas turbines run on heavy fuel oil are referred to by the chairman, Sir Philip Johnson, in a foreword to the annual report of the Pametrada Research Station, Wallsend.

R.I.C. Tennis Tournament & Dance

The London section of the Royal Institute of Chemistry is holding a tennis tournament and dance on 10 July at the Sports Ground, University of London, King's College, Lavender Avenue, Mitcham. An American tennis tournament will begin at 2.30 p.m. The charge will be 2s. 6d. per head for those playing, and a cup will be awarded to the Institute member returning the highest individual score. Dancing, for which a charge of 2s. 6d. per person will be made, begins at 7.30 p.m.

OVERSEAS

Further Oil Tests Fail

A report from Melbourne states that further attempts to make an oil test at West Australian Petroleum's No. 1 well at Rough Range, Exmouth Gulf, have proved inconclusive.

Pilot Terylene Plant Completed

The pilot plant of the $20,000,000 Terylene project under construction at Millhaven, near Kingston, Ontario, has now been completed, states an announcement by Dr. Richard Beeching, vice-president of Imperial Chemical Industries of Canada. Dr. Beeching reveals that there are more than 1,200 construction workers at present on the site, and that the main plant may well be completed ahead of its schedule date, mid-1955. Output of the pilot plant will be 1,000,000 lb. a year.

Mineral Discoveries in Japan

Japanese geological survey parties have discovered a deposit of high-grade titanium ore, estimated at over 56,000 tons, in a south central prefecture. Sheet glass, ceramics and paper manufacturers and steel producers are looking forward to the exploitation of substantial deposits of high grade dolomite discovered in the mountainous district west of Nagoya. It is also reported that coal mined in Hokkaido, Japan's most northerly island, contains germanium, and two firms are planning fairly large scale production of this element.

Expanding Israeli Company

The Israeli Fertilisers and Chemicals Co. Ltd. sold products worth IL. 2,500,000 in 1953-54, as compared with IL. 1,000,000 worth in 1952-53. The gross profit of the company in the year ending March, 1954, was IL. 800,000, as compared with a gross profit of IL. 300,000 in 1952-53. The production of sulphuric acid in particular expanded last year, and as a result of the putting into operation of the company's new plant, which can produce 80,000 tons yearly, reached a total of 23,000 tons. Production of superphosphates also increased considerably, reaching 41,000 tons during the year, as compared with 24,035 tons in 1952-53—an increase of over 70 per cent.

India's Coal Tar Exports

India has decided to release a quota of 5,000 tons of coal tar for export up to the end of 1954. It will be administered by the Joint Chief Controller of Imports and Exports, Calcutta.

Rubber Research in Canada

Formation by the Dunlop Rubber Co. (England) Ltd. of a research centre in Canada has been announced. To be closely associated with the Dunlop research centre at Birmingham, the new centre will conduct research involving new materials, chemicals, processes, techniques and equipment.

Pyrochlore in Tanganyika

Deposits of pyrochlore have been found near Mbeya, in the Southern Highland Province of Tanganyika, following a Government survey. The Commissioner of Mines, Mr. V. T. Hockin, stated that there is reason to believe that some millions of tons of potentially valuable ore exist, although it is too early yet to attempt to give a reliable estimate of the tonnage.

Rayon Plant for Yugoslavia

Two big Japanese concerns, Mitsubishi Engineering and Shibaura Electric, have announced that final plans have been approved for the supply of a $12,000,000 viscose rayon plant to Yugoslavia. The plant, which will be erected at Loznice, will be capable of producing more than 20,000 tons of filament rayon yarn, rayon staple, rayon tyre yarn and film.

Morgantown Experimental Station

Plans are being made for the US Bureau of Mines to occupy the new Morgantown, W. Virginia, experiment station, accommodation for which will include laboratory and pilot plant equipment and personnel engaged in research on that part of the Bureau's synthetic liquid fuels programme which deals with the experimental production of synthesis gas; laboratory equipment and personnel engaged in petroleum and natural gas research in the Appalachian region; and district headquarters for mining studies and health and safety work. The new station occupies a 45-acre tract.

PERSONAL

SIR FREDERICK BRUNDRETT, deputy scientific adviser to the Ministry of Defence since 1950, has been appointed to succeed SIR JOHN COCKCROFT as chief adviser to the Cabinet on defence research. Sir John, who has held that appointment for three years, is to become director of the new Atomic Energy Corporation.

MR. J. M. THRUSSELL, sales director of the United Glass Bottle Manufacturers Ltd., has, owing to ill-health, relinquished his seat on the board on his retirement from the company.

MR. JOHN C. HANBURY is to be the new chairman of Allen and Hanburys Ltd., pharmaceutical manufacturers. He succeeds as chairman his father, Mr. F. Capel Hanbury, who retired on 30 June, after 50 years with the company.

MR. L. P. O'BRIEN has been re-elected chairman, and MR. C. H. BURTON, vice-chairman, of Laporte Industries Ltd. MR. P. D. O'BRIEN has been elected deputy chairman. Mr. L. P. O'Brien is managing director, and Mr. P. D. O'Brien and MR. B. E. A. VIGERS are joint managing directors.

MR. HARRY BURDETT, who recently retired from active directorship of Croid Ltd., a subsidiary of British Glues and Chemicals Ltd., was presented with an illuminated address at the 21st annual garden party of the latter company at the home of Mr. Harold J. Cotes, managing director, and Mrs. Cotes, at Sutton, Surrey.

MR. L. HARRAL, a pioneer of the world-wide latex foam industry, has relinquished his post as general sales manager of Dunlop's Dunlopillo division. He remains, however, a local director of the division. MR. GEORGE F. CARR, who has been Dunlopillo sales manager to the upholstery trade since 1948, succeeds Mr. Harral as general sales manager. Mr. Carr, who is 41, has been with Dunlop for 24 years.

DR. NORMAN S. GRACE, former chief chemist and technical superintendent of the Dunlop Tyre and Rubber Goods Co. Ltd., has been appointed general manager of the new research centre set up by the Dunlop Rubber Co. (England) Ltd. in Canada.

At the 7th annual general meeting of the Fertiliser Society, held at Norwich on 24 June, MR. J. T. PROCTER was elected president and DR. R. STEWART vice-president. MR. C. T. WARD, MR. R. G. WARREN and MR. R. A. WEBB were elected to fill vacancies on the Council.

MR. BRIAN H. TURPIN, managing director of QVF Ltd., the new company formed to market the glass pipeline manufactured by James A. Jobling & Co. Ltd., and the industrial plant in glass of Quickfit & Quartz Ltd., left on 27 June for a fortnight's visit to the United States.

The President of the Board of Trade has reappointed SIR PERCY H. MILLS as chairman of the National Research Development Corporation and PROFESSOR P. M. S. BLACKETT, SIR JOHN MCL. DUNCANSON and SIR EDWARD DE STEIN as members for a further period. SIR HENRY HINCHLIFFE and SIR ALAN SAUNDERS are also appointed members in place of SIR EDWARD HODGSON and MR. W. E. P. JOHNSON, who are retiring.

MR. E. RALPH ROWZEE, 46-year-old vice-president of the Polymer Corporation of Sarnia, Ontario, was last week elected president of the Chemical Institute of Canada. The 37th annual conference of the Institute, which ended on 23 June, awarded the Institute's Medal for 1954 to DR. R. K. STRATFORD, scientific adviser to Imperial Oil Ltd., and president of the Research Council of Ontario.

Obituary

MR. JAMES POUND, who died on 15 June, at 68 Finnemore Road, Birmingham, aged 82, was for many years associated with the firm of Chance & Hunt Ltd., of Oldbury.

MR. HUGH GRIFFITHS, a consultant chemical engineer, of 176 Blackfriars Road, London, S.E.1, died at his home at 240 Upton Road, Old Bexley, Kent, on 26 June. Mr. Griffiths was well known in the chemical engineering industry, being a specialist in solvents recovery and activated carbon. He was a director of Lansil Ltd., and a former president of the Institution of Chemical Engineers.

Publications & Announcements

NEWLY published is a catalogue of Audco lubricated valves, from the Audley Engineering Co. Ltd., Newport, Shropshire. Audco valves are available in most materials of construction, and in such sizes as 16 in. tested to 2,000 psi., 12 in. tested to 3,000 psi., 8 in. tested to 4,000 psi., and 4 in. tested to 6,000 psi. The catalogue gives complete specifications and sizes of the range of valves, and is divided into convenient sections applicable to various industries. There is a section devoted to power operation and remote control, and one to lubrication, care and maintenance; finally, there is a selection of useful tables.

* * *

CHANGE of name of one of their subsidiary companies is announced by Sheepbridge Engineering Ltd., of Chesterfield, parent company of the Sheepbridge group. Sheepbridge Steel Castings Ltd., of Sutton-in-Ashfield, Notts, now becomes Sheepbridge Alloy Castings Ltd. The change of title, it is stated, is designed to indicate the wider field of special, ferrous and non-ferrous metal production that has been planned for this member of the Sheepbridge group. A new bronze foundry is being developed at Sutton for the production of special non-ferrous alloys. Another new development is the production of long length tubes centrifugally cast in special metals. By means of a patented process, the Sutton plant will now be able to offer British engineers, in long lengths, centri-cast pipes and tubes in low or high alloy steels of the stainless or heat-resisting types; ,or, for example, piping consisting of a mild steel exterior lined with a stainless steel interior, or conversely a mild steel pipe with an exterior surface of heat-resisting steel. The range of application of the new Sheepbridge development, it is stated, extends from large cylinder liners for marine diesel engines to stainless steel radiant tubes for the furnace industry.

* * *

RECENTLY published by Iliffe and Sons Ltd. is *Motor Transport* 'Cost Tables and Fuel Consumption Cost Reckoner.' The publicaton, which cost 1s., gives the latest costs of running all types of goods vehicles, including the vehicle levy that came into force on 1 January. Variation in road haulage drivers' wages and the cost of petrol and diesel fuel have been taken into account. The tables show the standing costs per year, per week and per hour; the running costs per mile and the total charge per mile over a range of annual mileages for each size of vehicle, according to the part of the country in which it is based. Factors are included which enable the tables to be speedily adjusted by the user to allow for future fluctuations in fuel prices.

* * *

REGULAR bulk delivery of liquid sulphur recently initiated between the Stanlow chemical plant and Brotherton and Co. Ltd., of Bromborough, Cheshire, is the subject of an interesting article in the June issue of *The Shell Magazine*. Another feature with the title 'The Long Haul to Athabaska,' tells of the story of the transportation of sulphur from the Shell Oil Company of Canada's Jumping Ground plant to help produce uranium in the Lake Athabaska territory of Northern Saskatchewan. The issue also carries a review based on the Survey of Group Activities issued by the Shell Transport and Trading Co. Ltd. to shareholders.

* * *

THE firm of Londex Ltd. announce that their well-known range of LQA mercury switch relays has been extended to include a new heavy duty 60 amp. triple pole unit. By using an economy resistor in series with the relay coil, the current consumption is limited to about 10 Va, and the contactor can thus be controlled by a thermostat or other lower powered device. The totally enclosed contactor, it is stated, can handle up to 500 volts, and the contactor has a wide application in industry, particularly in chemical works, hazardous locations, and where space is limited. It is described as being suitable for the control of pump motors, heating and lighting loads, many of which have previously been outside the range of this type of relay contactor. It is available mounted on baseplate or in sheet metal or cast iron cases. Other new leaflets issued by the firm describe the operating principle of the 'Lectralevel' floatless level control equipments, which operate by the conduction of a small current through the liquid, no float being necessary; and control units for small generating sets.

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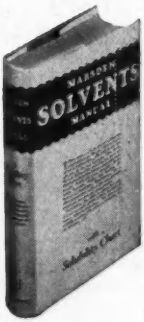

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Law & Company News

Mortgages & Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

T. BLACKWELL & SON LTD., London, E.C., plastics manufacturers, etc. 20 May, £550 mortgage, to Glass Components Ltd.; charged on land and premises at Brooker Road, Waltham Abbey.

O. M. SEMAN LTD., Southall, manufacturers of chemicals, etc. 15 May, £750 (not ex.) charge, to Lloyds Bank Ltd., charged on land and factories, etc., thereon at Kingsbridge Crescent, Southall. *Nil. 21 October, 1950.

POLYMER (UNITED KINGDOM) LTD., London, E.C., synthetic rubber, etc. 18 May, deed supplemental to a debenture dated 4 April, 1952, increasing the limit of the amount secured thereby from £150,000 to £300,000, to Bank of Nova Scotia; general charge. *£67,504. 13 May, 1953.

Satisfactions

W. EDWARDS & CO. (LONDON) LTD., scientific apparatus dealers and manufacturers. Satisfactions, 28 May, of charges registered 9 December, 1940, and 9 January, 1947.

MATTHEW TURNBULL LTD., Sunderland, glass manufacturers, etc. Satisfaction, 27 May, of a charge registered 9 July, 1952 (re 82 Devonshire Street, Monkwearmouth).

Increases of Capital

The following increases of capital have been announced: WILLINGTON MEDICALS LTD., from £5,000 to £10,000; NUTFIELD MANUFACTURING CO. LTD., from £20,000 to £50,000; J. C. THOMPSON & CO. (DURON) LTD., from £2,000 to £6,000; CRONE & TAYLOR (FERTILISERS) LTD., from £100 to £15,000.

Market Reports

LONDON.—Steady conditions are reported from all sections of the industrial chemicals market, with prices firm at recent levels. The movement on home account continues to be brisk with the routine demand for soda products fully maintained. The scale of inquiry for shipment shows no signs of diminishing, and bookings are mainly for Commonwealth destinations. The coal tar products market is without any new feature, and in most cases supplies are absorbed as soon as available.

MANCHESTER.—Steady to firm price conditions have been maintained during the past week in virtually all sections of the Manchester market for heavy chemical products. Holiday conditions in consuming centres are having an increasingly adverse effect on the movement of supplies, but allowing for this seasonal factor current deliveries and the volume of new business in the alkalis and other leading products is regarded as satisfactory. With an odd exception the light and heavy tar products are also meeting with a steady demand at firm rates. Fertiliser materials, however, are still experiencing a seasonal lull.

GLASGOW.—The tone generally has been somewhat quieter but the week just past has not by any means been devoid of interest. Prices have been steady and generally speaking a fair trade has been conducted.

Next Week's Events

SATURDAY 3 JULY

Royal Institute of Chemistry

National Coal Board, Betteshanger Colliery, near Deal, Kent: 10.30 a.m. Visit by London section.

TUESDAY 6 JULY

Royal Institute of Chemistry

Dagenham: Visit by London section to May & Baker Ltd. Coach leaves 30 Russell Square at 1.30 p.m.

TUESDAY TO FRIDAY 6-9 JULY

Institute of Chemistry of Ireland

Dublin: Summer School in Organic Chemistry, at University College.

THURSDAY 8 JULY

Royal Institute of Chemistry

BBC Television studios, Lime Grove, London, W.12: Visit by London section, 2.30 p.m.

SATURDAY 10 JULY

Royal Institute of Chemistry

Mitcham: Tennis tournament and dance, arranged by London section, at King's College Sports Ground.

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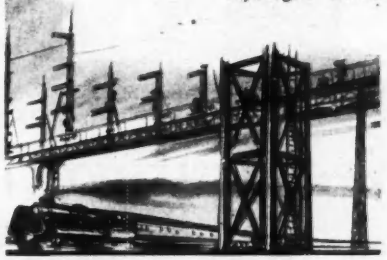

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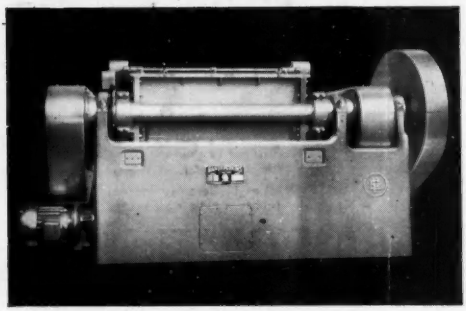
266/38

UNIVERSAL MIXING MACHINES



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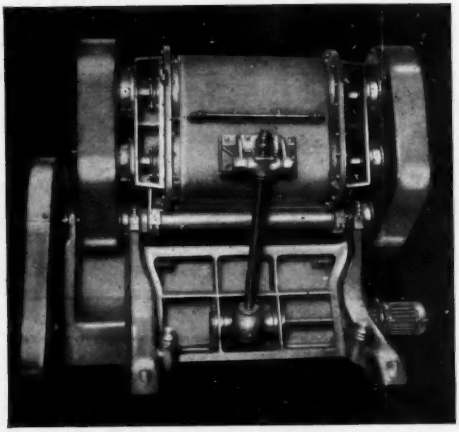
Above. Front view of a Size 17 Type VIII Class B.B. for 176 gallons per mix.

Below. Rear view of same machine tilted for emptying.



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